HOW APPOINTMENTS TO FOREST SERVICE WILL BE MADE

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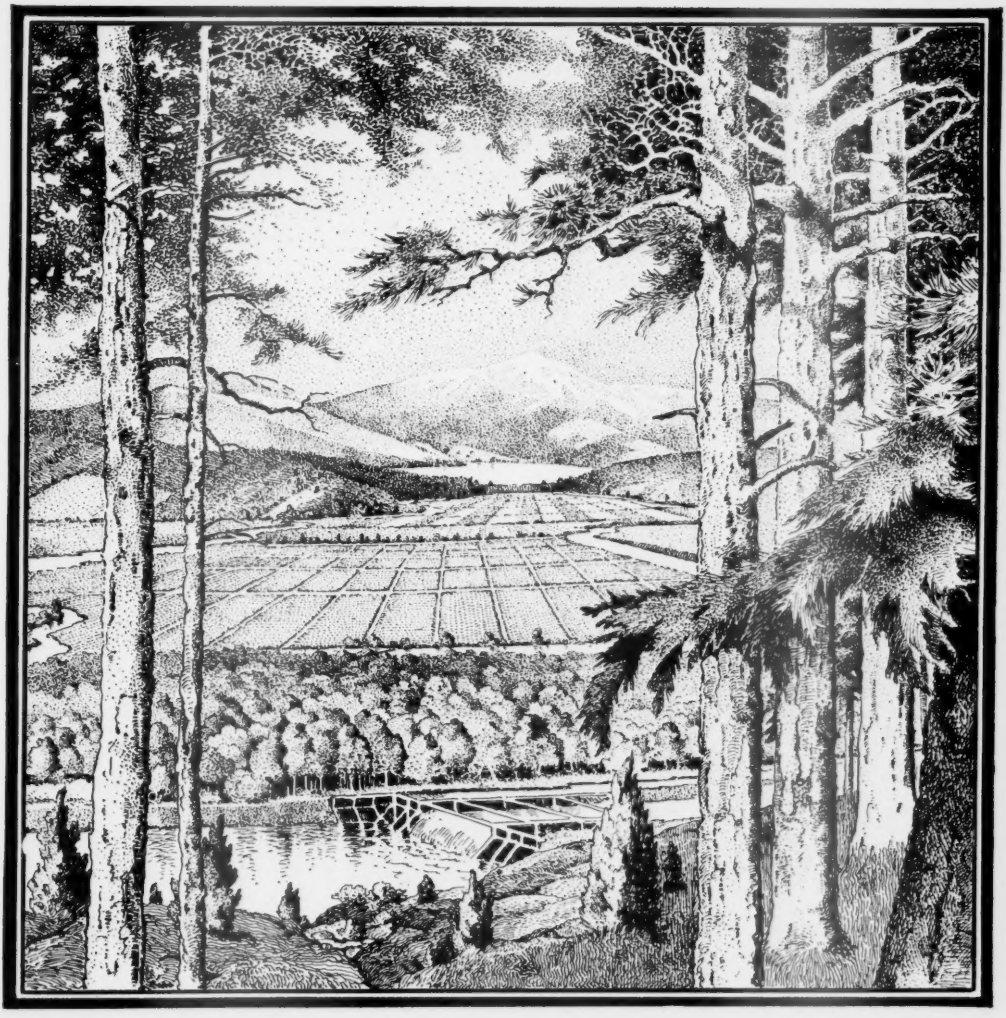
FORESTRY & IRRIGATION



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FORESTRY IN NEW YORK STATE, By J. Y. McClintock

ORGANIZED APRIL, 1882 INCORPORATED JANUARY, 1897

THE

American Forestry Association

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Secretary American Forestry Association
Box 356, Washington, D. C.

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Very truly yours,

Name_____

P. O. Address_____

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Forestry and Irrigation

H. M. SUTER, Editor

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JOHN E. SHERIDAN

Mount Bond, New Hampshire. Clear Cutting on the Upper Slopes.

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NEWS AND NOTES

Proceedings Delayed

Through unavoidable circumstances in preparing the proceedings of the American Forest Congress for publication in book form, the issuance of the finished volume has been delayed beyond the time originally counted on. The entire matter is now in the hands of the printer, and the volume will appear by June 1, and perhaps several days in advance of that date.

New Consulting Engineer

As announced in the daily papers, Mr. Carl Ewald Grunsky, formerly a member of the Panama Canal Commission, was recently appointed consulting engineer and adviser to the Director of the U. S. Geological Survey, at a salary of $10,000 a year. Mr. Grunsky was born in San Joaquin county, California, on April 4, 1855. He attended the public schools of Stockton, being the only male member of the first class graduated from the Stockton High School in 1870.

After teaching school for a year as principal of South School, in Stockton, he determined to acquire a professional education in Germany. Accordingly he spent nearly six years in Stuttgart, Würtemberg, as a student in the "Real-Schule" and in the Polytechnic Institute, from which he was graduated as civil engineer at the head of his class in 1877.

His first professional employment was as topographer with a river surveying party of the State Engineering Department of California, in 1878. He was made assistant State Engineer in charge of computations and office work relating to stream gaging in 1879, and was advanced to Chief Assistant in 1882, continuing as such till 1887.

From 1887 to 1899 he was in private practice at Sacramento and in San Francisco, also serving during 1889 and 1890 as a member of the Examining Commission on Rivers and Harbors for California. In 1892-93 he was one of the engineers selected to design a sewer system for San Francisco, and served on the Sewerage Board of that city. In 1893-94 he again served the State of California as a consulting engineer to the Commissioner of Public Works, dealing with drainage and river rectification problems.

A Board of Public Works was created by a new charter for San Francisco, in January, 1900. This board, under the presidency of Col. G. H. Mendell, appointed Mr. Grunsky City Engineer of that city, which position he held until appointed one of the Isthmian Canal Commissioners. As City Engineer of San Francisco he made plans for a municipal electric light plant, a municipal gas works, a municipal telephone system, water works for a supply of water from the Sierra Nevada Mountains, estimated to cost about $40,000,000; a city railway system and various public improvements, including a system of main sewers ($7,250,000), public buildings and parks for which bonds have been voted aggregating about $17,000,000.

In private practice, Mr. Grunsky has been engineer for several irrigation and drainage districts and con-

sulting engineer for a number of cities on sewerage and water supply systems. In 1897 he contributed several water supply papers to the U. S. Geological Survey's publications, and in 1899 and 1900 was one of the experts reporting to the United States Department of Agriculture upon irrigation and use of water from rivers in California.

Railroad Rates for Reclamation Service.

In carrying on the work of the Reclamation Service, it was found that the various railroad companies recognized the value to them of the railroad traffic to be built up as a result of the development of the country by the Government irrigation systems. The companies were willing to assist in every way possible, and accordingly, contracts were made between various western companies and the Secretary of the Interior to provide for concession of rates for freight carried in connection with the construction performed by the Reclamation Service.

These concessions of rates were made in pursuance of section 22 of the Interstate Commerce Act, which permits railroad companies to carry free or at reduced rates any material for the United States.

These contracts provide that contractors' plant to be used in connection with these projects is to be carried at certain reduced rates, and the question has arisen whether such arrangements are lawful.

This question was carefully considered by the Department when these contracts were before the Secretary of the Interior for execution, and it was held that the method adopted by the Reclamation Service to obtain the benefit of these rates brought these concessions within the law, because all bidders on the construction work were notified of the reduced rates and each of them necessarily figured upon reduced rates to be given by the railroad companies in preparing their bids for the work.

In this manner, the bids were all made on the basis of the low freight rate and were necessarily less by an amount equivalent to the concessions of rates made by the railroad companies.

The question has been much discussed in the press recently, and the Interior Department has submitted the entire matter of the legality of these contracts to the Attorney-General.

The amounts involved are very large, as the plant and material used in the construction of these projects are very bulky and the freight amounts to a large sum. It is estimated that on the Truckee-Carson project, in Nevada, the freights paid already amount to over $100,000, and this is about one-tenth of the amount expended by the Government upon the construction.

The concessions in rates given by the railroad companies vary according to the nature of the material. In some cases the reduction is as much as 50 per cent. Considering that there are now under construction, or soon to be undertaken, twelve different irrigation systems, it is evident that the saving on these freights will in a few years be sufficient to enable the Reclamation Service to construct an additional million-dollar project solely from the savings on this account.

It is to be hoped, therefore, that the views of the Interior Department to the effect that the entire benefit of these concessions is obtained by the United States, will be found correct by the Attorney-General, as it will mean a very considerable increase in the amount of construction which can be undertaken by the Government under the Reclamation Act.

State Foresters Wanted

State foresters are wanted both in Indiana and California. In the first-named State his duties will be to take charge of the State forest reserve and to further the cause of forestry in the State by coöperation with private owners, by studies, and by lectures. The salary is fixed at $1,500 in the beginning. In California, a forester is wanted to execute, under the supervision of the State

Board of Forestry, all matters pertaining to forestry within the jurisdiction of the State, as provided in the act of March 20, 1905. The salary offered is $2,400 a year. Application for either of these positions should be made to the Forester, U. S. Department of Agriculture,Washington, D. C.

Colorado College Starts Arboretum

The Colorado State Agricultural College, at Fort Collins, will starte an arboretum on the college farm at that place this spring. It is proposed later to include shrubs in the arboretum, but this year only trees will be selected, and the varieties include nearly every kind and species growing in the latitude of Cincinnati. It is a rather unusual fact that no hickory, beech, ironwood, gum or sassafras, and only isolated specimens of the American oak are found in Colorado, and the specimens of these kinds of trees included in the arboretum will be the first in that State as far as is known. The college is preparing for an extended experiment with black locust and catalpa speciosa. It plans to secure the coöperation of about 20 farmers over the State, who will assist in the matter; the college to furnish the stock and direct the planting, and the farmers the land and labor. The contemplated plans call for plantations each comprising one-half an acre, planted to the two varieties, each half, and containing 600 trees. The catalpa has been tried to a certain extent in Colorado and found wanting, but it is claimed that its failure to fulfil expectations is due to the fact that nearly all varieties found in the State are hybrids, or of the tender variety, it being a difficult matter to find a pure catalpa speciosa.

Aside from the value this experiment by the Colorado State College will undoubtedly have in increasing the forested area of the State, its arboretum should establish what trees are best adapted to Colorado—those which will thrive under such climatic and soil conditions as are most prevalent.

Maine's New Forest Law

An act comprising in general the provisions of the old Maine forest law, but with the modifications recommended by the Bureau of Forestry after a study of the control and prevention of forest fires in Maine, was approved on March 8. The Forest Commissioner is directed to establish forest districts and appoint for each a chief fire warden and deputy fire wardens to carry out the provisions of the act. Specific outline of the duties of each is given and the former are allowed $2.50 per day compensation for actual work, with fees for prosecutions of violators of the laws, and the latter receive $2.00 per day actually employed. Expense incurred under the provisions of this act is to be paid for from the funds appropriated to and for the use of the Forest Commission.

Oregon Has a Forest Law

Under the title, "An Act providing for the protection of the forests and timber of the State of Oregon, and for protection from forest fires, and the destruction of timber by fire, and providing for the appointment of fire rangers and their duties," etc., the Oregon legislature passed a comprehensive measure looking for the protection of its forests. In the act is defined a "close season," from June 1 to October 1, in which period of time penalty is imposed for any person operating a locomotive, engine, etc., without a spark-arrester in or near woodland. Also during that same time, no fires shall be set in or near woods or in the vicinity of grain lands, without permit, and the maximum fine is fixed at $1,000. Punishment is provided for careless campers, hunters, woodsmen, lumbermen, etc., who use fire in wooded areas unless certain precautions are taken. Fire notices are to be posted, and a penalty is imposed for their defacement or destruction. Section 9 provides that "Any person who shall detect anyone violating any of the provisions of this act, and shall furnish information leading to the arrest and conviction of such

person, shall receive one-half of the fine paid by such person so convicted. * * *"

New York's Forest Policy

In a message to the State legislature, transmitted on March 9, Governor Higgins outlined his policy in regard to the administration of the State forest lands. The gist of his recommendations are as follows:

(1) That the proposed constitutional amendment permitting the removal of burnt timber be not submitted to the people.

(2) That the forest laws be so amended as to insure the prevention of trespass, to compel the prosecution of malicious trespassers, both civilly and criminally, to the full extent of the law, and the seizure by the State of all timber cut or removed by trespassers from State lands, and to prevent the condonation of trespassers.

(3) That provision be made for the submission to the people of a constitutional amendment permitting a more scientific delimitation of the forest reserve, so as to permit the sale of lands other than wild forest lands now included in the preserve, and the purchase with the proceeds thereof of other forest lands.

Should these provisions be ratified by the legislature, it means a whole change in the policy of New York in regard to her forest lands. The policy at present in force absolutely prevents, on State lands, the practice of scientific forestry, since it provides that all forest preserves should forever be kept as "wild forest lands."

As a result of these recommendations, Senator Allds introduced a bill for the reorganization of the State plan for the protection of the forests. The bill places the care of the forests in the Forestry Department of the Forest, Fish and Game Commission, and gives the Commissioner sole authority to bring action for trespass, thus doing away with the divided responsibility now existing. Governor Higgins' message is a strong plea for recognition of the importance of forestry, and his recommendations are well brought out and strongly emphasized.

North Dakota Encourages Tree Planting

An Act passed by the North Dakota State Legislature, and approved by the Governor February 28, allows an annual deduction of $3 in taxes for each acre planted in any kind of trees, set not more than 8 feet apart, in real estate holdings of 80, 120, or 320 acres. Where persons plant trees suitable for hedge in rows along public highways, or upon their own premises, at the rate of more than two trees to each rod, they will receive or have deducted from their taxes annually a bounty of $2 for every eighty rods of each row in length. This applies only in periods of less than five years for each particular row. Persons wishing to secure the benefit of this measure are required to file with the county auditor or clerk in their county a diagram or plat of the trees planted, and must make oath, together with two freeholders residing in the near vicinity, that the trees have been properly planted and cultivated, and that the diagram submitted is correct. Railroads planting trees within two hundred feet of their track or trees planted on land held under the Timber Culture Act of the United States are not included in the act. Section 4 of the act directs the duty of each assessor to the act, and outlines their method of procedure in allowing the claim.

New Hampshire Forest Fire Law

To better protect the forests of New Hampshire from forest fires, the legislature of that State has recently passed a new fire law. Fire wardens are created, and their duties outlined. Among the most important of these is the requirement that, upon direction of the Forestry Commission, they shall patrol forested areas, and post warning notices and extracts of the forest fire law. The warden is vested with the right to arrest, without warrant, all violators of the measure. "Reasonable compensation" is allowed for services of persons, or prop-

erty, used by the fire warden, and it is made an offense punishable by fine to ignore the warden's call for assistance, either personally, or in their use of wagons, tools, etc. The chief of the fire department in such towns as have such an organized department is designated as fire warden for that town, and where no such department exists, the Forestry Commission will appoint one of the Board of Selectmen to that position. Their compensation is to be paid for by the towns themselves, and at the regular salary they are ordinarily paid as members of the fire department or as selectmen. A severe fine is provided for any fire warden who neglects or refuses to perform his duties, and a section provides that, upon application of owners of forest lands in unorganized towns, special fire wardens may be appointed by the Forestry Commission, which board also fixes their salary. One-third the cost of these is borne by the owners, one-third by the township, and the remaining one-third by the State. It is also provided that persons discovering a forest fire must extinguish it, or report its location immediately to the fire warden, or be liable to a fine.

Indiana Protects Its Forests

The Dausman bill passed by the Indiana legislature, is designed to protect forest lands in Indiana, after nine sections providing that one-eighth of any farm used for forestry purposes under the direction of the Bureau of Forestry, should be exempt from taxation for twelve years, had been stricken out. The act passed provides a maximum fine of $50 for any person who sets fire to any woods belonging to another, or allows fires from his own land to spread to woods owned by others. It also empowers the road supervisor to employ aid to extinguish fires which started in his district.

To Save Washington's Forests

Representative Irving's bill in the Washington legislature, introduced on Feb. 23, and providing for the creation of a State Board of Forest Commissioners, a fire warden, and a forester, and later passed, will have the effect of safeguarding more closely the forest wealth of that Pacific Coast State from the destructive forest fires of recent years, and the almost equally destructive ravages of lumbermen with the slogan "cut clean." The State Forester is to have a salary of $1,800 a year, but the Board of Commissioners serve without compensation. A chief fire warden is provided for, and the board has the power to appoint special deputy fire wardens, to serve in such sections of the country as in their opinion require especial supervision and care. Washington already has a law requiring spark-arresters on engines, etc., in forest lands, but there has never been a rigid enforcement of the act, but in the measure passed, the fire wardens are specially directed to see that all laws promulgated are respected, and to arrest and convict violators. Persons refusing assistance in fighting forest fires, when called upon to do so by wardens or deputy wardens, are liable to a fine. All State land cruisers are constituted *ex-officio* forest rangers, and supplementary rangers may, in addition, be appointed by the board. All such wardens, rangers, deputy rangers, and police officers are empowered to make arrests without warrant. Persons setting fire to forest lands not their own, or who start dangerous fires near forest lands during the closed season are liable to arrest and conviction. A direct appropriation of $25,000 is made for carrying out the provisions of the act.

Fight to a Finish

One rarely sees more forcible evidence of a prolonged battle for existence and its final outcome than that of the live oak and grapevine shown in the accompanying illustration, which is from a photograph recently made in the coast region of North Carolina by Mr. Romeyn B. Hough, publisher of "American Woods."

Here is a sturdy live oak, perhaps

several centuries old, and beside it in early days a grapevine started its existence. Little by little it extended its octopus-like branches up and finally over the oak. In course of time it for its trunk had attained the unusual size of nearly a foot in thickness. This size is also evidence that it was winning the victory, as is further attested by the fact that it had partly killed the

Photo by Romeyn B. Hough.

Illustration of a Finish Fight Between a Live Oak and a Grape-Vine in a North Carolina Forest.

nearly enveloped it, appropriating to itself the life-giving sunlight for which the live oak was also striving. How long the struggle must have continued is shown by the great size of the vine, tree. But one of its massive folds near the base had become involved in the crotch of the tree which gradually closed in upon it, constricting it, as though with monstrous jaws, until

it has nearly killed the vine. It is only a question of a little more time when its destruction will have been complete and the tree will again revel in its full measure of coveted sunlight.

Vermont's Forest Legislation

In a bill entitled "An Act relating to the preservation of the forests," and another "to encourage planting and perpetuating forests," Vermont has two new measures, passed at the latest session of its legislature, which should help a great deal to encourage the practice of forestry within its boundaries. The first act provides for the selection of a Forestry Commissioner by the Governor from the Board of Agriculture, and constitutes the first selectman in each town as a forest fire warden in his own town, with compensation during the time he is employed at the same rate he is paid for his other official duties. He is authorized to employ help in fighting forest fires at the rate of fifteen cents an hour and may demand the assistance of all townspeople in extinguishing the same, there being a penalty provided for persons refusing to do this. Should a town require more than five per cent. of the amount on its grand list for the extinguishment of fires in one year, the balance is to be paid for out of the State treasury. Penalty is fixed for persons who leave camp fires unextinguished, and parties kindling fires for brush-burning, etc., are warned to exercise care in starting and controlling them.

The Forestry Commissioner is to prepare forest fire warnings and notices and extracts of the law and have the same posted, and will prepare, or have prepared, bulletins and circulars treating of forest fires, their prevention, best methods of controlling and extinguishing, care of forest lands, best methods of lumbering, and in general diffuse a practical knowledge of forestry.

The second act exempts from taxation all waste or uncultivated land within the State which shall be planted with timber or forest trees under regulations issued by the State Forestry Commissioner, and in accordance with his directions. The Commissioner is directed to prepare such regulations in regard to the number of trees per acre, species to be planted, time of the year when such planting shall be done, etc., and must keep a record and make report of such exemptions.

The first act is not quite as complete and comprehensive as might be desired, but the second is a most excellent move, and by offering to owners of uncultivated or waste lands an inducement to plant trees will undoubtedly have the effect of reforesting for the future much of the worthless land of the State, with a crop that is constantly increasing in value.

New Jersey Forest Legislation

A bill was introduced in the New Jersey legislature by Mr. Alexander R. Fordyce, jr., and later passed by that body, providing for the appointment of five commissioners for the examination into the advisability of creating State forest reserves, and to recommend methods of their acquirement and administration by the State, and suggesting protective legislation. This commission is to make a complete printed report to the next legislature.

A second act, introduced also by Mr. Fordyce, on February 7, and which recently passed both houses and was signed by the Governor, thereby becoming a law, is even more indicative of the fact that the people of New Jersey are just now realizing what forestry means, and the beneficent results which State action will bring. The act creates a "State Board of Forest Park Commissioners," of which the Governor and State Geologist are *ex-officio* members, and to which is confided the reforestation of denuded lands, prevention of forest fires, administration and care of the State forests on the principles of practical forestry, coöperation with private owners of woodland, and encouragement in the preservation and growing of timber for commercial and manufacturing

purposes, and the general conservation of forest tracts around the headwaters and on the watersheds of all water courses. The board is to publish popular bulletins on the subject of forestry, for distribution, and make reports and recommendations. The State reservations may be acquired by deed, gift, or devise, or condemnation proceedings, and the board has power to acquire a fee simple estate to lands to be taken as reservations.

The act further provides for the appointment by the commissioners of fire wardens, and make it a misdemeanor to set fires on or near State forest reservations, or cut timber thereon, except when empowered by the board. Provision is made for the board to cut and sell State timber when it appears advantageous.

The three appointed members of the board serve without compensation, but with expenses paid by the State when in pursuance of their duties. A secretary of the board is created, with a salary to be fixed, who attests expenses and certifies amounts to be expended from the State moneys for the purchase of reservations.

The passage of this act marks a new epoch in forestry in New Jersey, a result of a liberal campaign of education that has led to understanding and appreciation, and a single law covering in so thoroughly comprehensive a manner the whole subject has seldom been enacted by a State legislature.

Appointments, Transfers; Reclam'on Service

Mr. John T. Keenan, of Colorado, has been appointed Assistant Engineer in the Reclamation Service. Mr. Keenan will engage in work on the Uncompahgre Valley project at Montrose, under the direction of I. W. McConnell.

Supervising Engineer B. M. Hall, who has had general charge of the investigations in the Rio Grande Valley in New Mexico and Texas, has been appointed Supervising Engineer for the Territory of Oklahoma, and will direct the operations of a number of field parties engaged upon surveys in that territory. Mr. Hall will also continue in charge of work on the Rio Grande.

Mr. Willis T. Turner, topographer, has been assigned to duty in Montana, and ordered to report to Mr. S. B. Robbins, who has charge of the Sun River project in that State. Mr. Turner has been in the employ of the Geological Survey since 1894, in various capacities on surveying. He was assigned to the Reclamation Service in 1903.

Mr. John C. Cleghorn, of Iowa, has received an appointment as Engineering Aid and ordered to report to S. B. Robbins, Great Falls, Montana, where he will be engaged in work on the Sun River project.

Mr. Frederick H. Tillinghast, Assistant Engineer, has been assigned to duty in Washington. Mr. Tillinghast made a special study of hydraulics and sanitary engineering in the Massachusetts Institute of Technology, and graduated from Brown University with the degree of C. E. He has held various positions as assistant supervising engineer on construction work for railways and power companies, and in 1902 was appointed to the position of assistant engineer in the Reclamation Service.

Mr. Clifford M. King, of Ithaca, New York, has received an appointment as engineering aid and has been assigned to duty in Idaho. Mr. King is a graduate of the College of Civil Engineering, Cornell University, and has been engaged in construction work on concrete roadbed and railroads, and last season had charge of the location of canal lines for the Deschutes Irrigation and Power Company, in Oregon.

Mr. Thomas H. Humphreys has been promoted from the position of Assistant Engineer to that of Engineer. He has been assigned to work at Klamath Falls under Supervising Engineer J. B. Lippincott. Mr. Humphreys is a native of Idaho and graduated from the Utah Agricultural College.

APPOINTMENTS TO THE FOREST SERVICE

Method to be Followed in Selecting Men for Government Forest Work

ON December 17, 1904, the President signed the following order:

"In the exercise of the power vested in the President by section 1753 of the Revised Statutes and acts amendatory thereof:

"IT IS ORDERED, That all persons employed in the field and in the District of Columbia in the 'protection and administration of forestry reserves in or under the General Land Office of the Interior Department' be classified and the civil service act and rules applied thereto, and that no person be hereafter appointed, employed, promoted, or transferred in said service until he pass an examination in conformity therewith, unless specifically exempted thereunder. This order shall apply to all officers and employees, except persons employed merely as laborers, and persons whose appointments are confirmed by the Senate."

This order classified the whole forest reserve service, and placed it under the civil service law. On February 1, 1905, by Act of Congress, this service was transferred from the Department of the Interior to the Department of Agriculture, without modification of the above order except in the further restriction entailed by the following section of the act:

"Sec. 3. That forest supervisors and rangers shall be selected, when practicable, from qualified citizens of the States or Territories in which the said reserves, respectively, are situated."

By order of the Secretary of Agriculture, dated February 1, 1905, the whole forest reserve service was placed in the Forest Service, under the direction and control of the Forester.

POSITIONS IN THE CLASSIFIED FOREST SERVICE. PRESENT ORGANIZATION.

The field force of the Forest Service now contains the grades of Forest Inspector, Forest Supervisor, Forest Assistant and Forest Ranger.

The position of Forest Inspector is filled only by the promotion of experienced men already in the classified forest service. Forest Inspectors are assigned to inspection upon forest reserves, or in other branches of the forest work.

Forest Supervisors are appointed by promotion from Forest Rangers or Forest Assistants and by competitive examination only when no Forest Rangers or Forest Assistants in the State concerned are qualified and available for promotion to Forest Supervisor. They are assigned to the charge of one or more reserves, and now receive from $1,000 to $2,000 a year.

Forest Assistants are appointed only by competitive examination and may be assigned to reserve duty or to work in other branches of the forest service. They receive from $900 to $1,400 a year.

Forest Rangers are appointed only by competitive examination and are assigned to police and patrol duty upon forest reserves and to conduct the business of the reserve under the direction of the Forest Supervisor. Forest Rangers now receive from $720 to $1,080 a year, or $60 to $90 a month.

PROPOSED ORGANIZATION.

The reorganization of the forest service will take place as the neces-

sary funds, and as men of the required training and experience, become available. The position of Deputy Forest Supervisor will be added, the position of ranger will contain the grades of Forest Ranger, Deputy Forest Ranger, and Assistant Forest Ranger, and salaries will be fixed as shown below:

Forest Supervisor, $1,800 to $2,500 a year; Deputy Forest Supervisor, $1,500 to $1,700 a year; Forest Ranger, $1,200 to $1,400 a year; Deputy Forest Ranger, $1,000 to $1,100 a year; Assistant Forest Ranger, $800 to $900 a year.

EXAMINATIONS.

In accordance with the law requiring selection of Forest Rangers and Forest Supervisors, when practicable, from the states in which they are to be employed, regular examinations for these positions are held as required in each State and Territory in which forest reserves are situated. These examinations are along practical lines and include tests in the actual performance of field work. Only legal residents between the ages of twenty-one and forty are eligible for Forest Ranger or Forest Supervisor. Applicants are examined as to fitness for positions in the state or territory of which they are legal residents. Only when examinations fail to secure thoroughly qualified men are vacancies filled by the examination of applicants from other states.

The restriction as to residence is not imposed upon applicants for the Forest Assistant examination, for which the age limit is twenty years or over.

Information as to the times and places at which examinations will be held, and the steps necessary to secure admission, may be obtained only from the U. S. Civil Service Commission, Washington, D. C.

GENERAL QUALIFICATIONS AND DUTIES.

FOREST SUPERVISORS.

For the purpose of encouraging good men to enter the service and to do good work, as well as to utilize their experience, appointments to the position of Forest Supervisor are made by the promotion of competent Forest Rangers or Forest Assistants, when the latter can be found in the States or Territories in which the vacancies exist. Should there be no thoroughly satisfactory resident, Forest Rangers or Forest Assistants, examinations of other applicants are held.

The qualifications for the position of Forest Supervisor include all those required of Forest Rangers, as hereafter outlined, with superior business and administrative ability. Applicants should not only be familiar with every detail of the work of the rangers and with the conditions of the forest region involved, but able to handle men, to deal with all classes of persons who do business with the forest reserve management, and to conduct the transactions, records and correspondence of the office. Knowledge of technical forestry is desirable but not essential. Candidates for the position of Forest Supervisor are required to furnish the most convincing proof of their moral and business responsibility.

While certain general qualifications are insisted upon in every case, special fitness for employment in a specified region is always considered. In many heavily forested regions knowledge of timber and lumbering is more important than familiarity with the live stock business, while the opposite is true in several interior reserves where grazing problems are numerous and little, if any, timber is sold.

Forest Supervisors must give their entire time to the service. They have full charge of their reserves, plan and direct all work, have entire disposition of rangers and other assistants, and are responsible for the effiiency of the local service. Under instructions from the Forester, Supervisors deal with the public in all business connected with the sale of timber, the control of grazing, the issuing of

permits, and the application of other regulations for the use and occupancy of forest reserves. They keep the records and accounts, and conduct the correspondence and general office business of their reserves, and make reports to the Forester on all matters under their jurisdiction.

FOREST ASSISTANTS.

The position of Forest Assistant requires technical qualifications of high order, and entails an examination which no man may reasonably expect to pass unless he has been thoroughly trained in scientific forestry, dendrology, and lumbering. Forest Assistants may be assigned to any part of the United States and must be competent to handle technical lines of work, such as the preparation of working plans and planting plans, the investigation of the silvical characteristics and the uses of commercial trees, the study of problems in wood preservation, and to conduct many other investigations requiring a trained forester.

FOREST RANGERS.

To be eligible as Forest Ranger of any grade, the applicant must be, first of all, thoroughly sound and able-bodied, capable of enduring hardships and of performing severe labor under trying conditions. Invalids seeking light out-of-door employment need not apply. No one may expect to pass the examination who is not already able to take care of himself and his horses in regions remote from settlement and supplies. He must be able to build trails and cabins, and pack in provisions without assistance. He must know something of surveying, estimating and scaling timber, lumbering, and the live stock business. On some reserves the Forest Ranger must be a specialist in one or more of these lines of work. Thorough familiarity with the region in which he seeks employment, including its geography and its forest and industrial conditions, is usually demanded, although lack of this may be supplied by experience in other similar regions.

The examination of applicants is along the practical lines indicated above, and actual demonstration, by perfomance, is required. Experience, not book education, is sought, although ability to make simple maps and write intelligent reports upon ordinary reserve business is essential.

Although initial appointment as Forest Ranger is usually to the lowest grade, in case of merit service therein may be only for a short probationary period. Increase of salary above the maximum for a Forest Ranger can be secured only through promotion to the position of Deputy Forest Supervisor or Forest Supervisor when a vacancy occurs. It is the policy to fill such vacancies by promotions of Forest Rangers or Forest Assistants, when competent men can be found, rather than by appointment of men without forest reserve experience although otherwise well fitted.

Where boats, saddle horses, or pack horses are necessary in the performance of their duty, rangers are required to own and maintain them.

The entire time of rangers must be given to the service. Engagement in any other occupation or employment is not permitted. Forest Rangers execute work of the forest reserve under the direction of the Forest Supervisor. Their duties include patrol to prevent fire and trespass, estimating, surveying and marking timber, and the supervision of cuttings. They issue minor permits, build cabins and trails, enforce grazing restrictions, investigate claims, and arrest for violation of reserve laws.

FOREST GUARDS EMPLOYED DURING FIRE SEASON.

In addition to the permanent classified force which comprise the Forest Service, temporary assistants are employed during the season of serious danger from fires. These are known as Forest Guards, and may be employed or dismissed by the Forest Super-

visor at any time. They are paid at the rate of $50 to $60 a month, and serve only as long as they are absolutely required; in no case over six months in any one year.

No examination is required of applicants for employment as Forest Guard. They are hired by the Forest Supervisor when fire patrol or other special work requires addition to the regular reserve force, and he is responsible for their satisfactory service. Applications must be made to him direct. He will require sobriety, industry, physical ability, and effectiveness, and will give preference to local residents of whose fitness he is fully satisfied. He may direct their work himself or place them under the supervision of a ranger.

The position of Forest Guard should not be confused with the existing grade of third-class ranger, which now carries the same salary.

FOREST CONDITIONS IN NORTHERN NEW HAMPSHIRE

Results of an Examination in the White Mountain Region

ALL that part of New Hampshire which lies north of Squam Lake and east of the lowlying agricultural lands along the Connecticut river is almost entirely forest covered, and for the most part will always be most valuable under forest growth. It contains 32 per cent of the total area of the State, or nearly 2,000,000 acres.

In the winter of 1903 the State legislature appropriated $5,000 for an examination and study of this region by the Bureau of Forestry. A full report on this work has been prepared, and will soon be published by the Bureau. It includes a description and estimates of the forest, by drainage basins, an account of the characteristics of all important timber trees, a careful discussion of forest fires and their effects, and a study of the lumber, paper pulp, and other State industries dependent upon the forest.

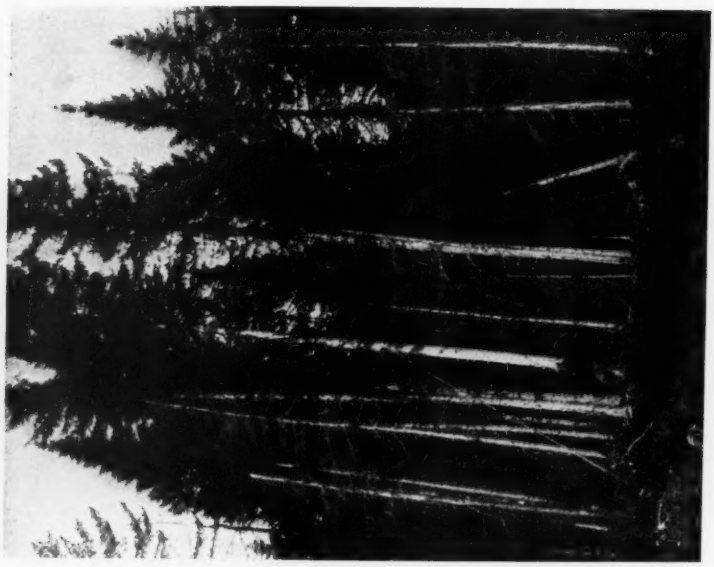
The region studied constitutes two classes, which differ considerably both in general character and in forest growth. The southern of these is the White Mountain region, which contains approximately 812,000 acres. It is very rough and rugged, with numerous broken mountain ranges intersected by deep, narrow valleys, with steep slopes, rapid streams, and all the conditions which invite soil erosion and permanent denudation of forest growth on the higher slopes, if careful lumbering is not practiced and fire is not kept out. In the extreme southern part of this region second-growth white pine forms a valuable part of the forest on the lower lands, but spruce is in general the leading commercial species. Before lumbering began spruce was much more common than now, and the effect of present methods is still further to decrease its representation and to substitute for it the hardwoods, which are usually of much lower commercial value.

The region north of the White Mountains is characterized by hills or low mountains and wide valleys, and contains many lakes. Here the spruce and balsam form a greater proportion of the forest growth than in the White Mountain region. While the greater part of this area has been cut over the lumbering has not been so intensive as in the White Mountains, but has consisted chiefly in culling out the best spruce, pulp wood of small di-

Scrubby Balsam at an Elevation of 4,800 Feet on Mount Madison, New Hampshire.

Dense Stand of Balsam on a Spruce Bog, Logged Fifteen Years Ago.

Virgin Spruce with Dense Balsam Reproduction on Mount Jackson, New Hampshire.



Second Growth Spruce and Balsam, Near Pittsburg, New Hampshire.

mensions not having been so extensively cut. As a consequence there is a great deal of small spruce and balsam on cut-over land. The region is admirably suited for continued timber production, and owing to its inaccessibility forest fires are not severe.

Until 1896 the greater part of the Mountain region was owned by the State. Since then the State has sold large and small tracts at nominal prices, until today all the forest land is in private ownership most of it held by large lumber and pulp companies. These companies are making formidable inroads upon the forests. Seven companies own nearly all the timber land, and three of them cut annually about 75,000,000 board feet, mostly from virgin forests. To this must be added the tremendous losses by fires. In 1903 nearly 85,000 acres were burned over, with a loss of over $200,000, not including the very great damage to the young growth and to the productive capacity of the forest. It is a hopeful sign, that two of these companies have adopted the policy of conservative lumbering.

Of the total area examined, approximately 2,000,000 acres, 989,592 are covered with softwoods, 34,752 with pine, 455,112 with hardwoods, and 244,036 acres are agricultural lands: the remainder is made up of burned, waste and barren land, and lakes and streams. The virgin merchantable forests comprise but 200,000 acres, while there are 1,363,711 acres of cut-over or culled land, and 120,495 acres of barren and waste land. The present stand of softwoods is computed to be 4,764,000,000 board feet and the annual cut is 249,639,000 feet. In 1900 the wooded area of the entire State was 3,228,000 acres and the cut for lumber amounted to 570,357,000 board feet. This is equivalent to 177 board feet per acre of wooded area, and is more intensive lumbering than in any of the big timber States, Wisconsin being next with 175 board feet per acre.

In relative importance in New Hampshire the lumber industry stands third, the paper industry fifth. From July 1, 1902 to June 30, 1903 the total amount of wood cut in the northern 562,000 board feet, of which 82.5 per cent., or 225,747,000 board feet was spruce. In the same year the paper and pulp mills used 109,041 cords of native spruce and 87,859 cords of Canadian spruce. The pulp companies are each year importing spruce in order to save their home forests as much as possible, and, by cutting them conservatively, to secure a continuous crop through natural reproduction. Lumber companies have not been so conservative; in many cases clean cutting has been the custom. The Bureau of Forestry recommends that all large lumber and pulp companies secure in their own interest as well as that of the region, the services of trained foresters to regulate the cutting.

The paramount forest menace, in New Hampshire as elsewhere, is fire rather than lumbering. But for the seemingly invariable rule that fire always follows lumbering, the cutting could and doubtless would be more conservatively done. The lumberman naturally argues: Why leave standing seed trees, or even trees of smaller diameter, only to be destroyed by fire? Thus while he is cutting he takes everything that he can sell, and leaves the young growth to take its unequal chance against fire. Let the State throw around the forests but a tithe of the fire protection furnished the business enterprises of its cities, and lumbering will immediately respond with methods adjusted to the better business risk.

North Sugar Loaf Mountain, New Hampshire. Once Heavily Timbered, But Now Practically Barren, as a Result of Clean Cutting and Fire.

Young Conifers Killed by a Severe Ground Fire.

First Connecticut Lake, New Hampshire. Effect of Constant Flooding for Storage.

Barren Upper Slopes of the Presidential Range. New Hampshire.

THE SANDALWOOD TREE IN HAWAII

BY

C. S. JUDD

IF any tree has ever been grossly maltreated it is the sandalwood tree in Hawaii. Of no especial value at first to the natives of the islands it grew naturally and abundantly in splendid mountain groves, but today only a few survivors are found in isolated parts of the country. The same avarice and human lack of foresight which swept away the American buffalo by the thousands has also been active in almost completely extirpating this tree in the Hawaiian Islands.

Of the three species of the sandalwood and about four varieties which grow in the islands, those most commercially important were the *Santalum freycinetianum* and *Santalum pyrularium*. These were straight, handsome trees attaining an average height of twenty-five feet and a thickness of one foot at the base. Another variety is reported to attain the height of eighty feet with a trunk three feet in diameter, while still other varieties were mere bushes growing along the rocky shore or in the inaccessible highlands. The wood of each species was compact, fine-grained, and of a yellowish color. On account of its remarkable fragrance it was called by the natives *laau ala* (odoriferous wood), while the name of the tree itself is *iliahi* (fire bark). In China it was purchased by the picul of 133½ pounds, the price varying from eight to ten dollars for the picul. Today genuine sandalwood is worth in China from $60 to $190 a ton. In that country there was a great demand for the wood where it was and is still used for ornamental carving, framework for fans, for perfumes and as incense in Buddhist temples. It is especially valuable for cabinet work for insects are repelled by the spicy odor of the wood.

The traffic in sandalwood marked the first commercial period in the history of the Hawaiian Islands. In some way the presence of the tree was suddenly discovered by early voyagers who knew its value and it seems to have been American ships that instituted the trade, for in 1792 two men were left from a Boston brig on the island of Kauai to contract for several cargoes of sandalwood for the China trade. The chiefs sent their serfs into the forests to fell the trees, clean the wood and bring it down by shiploads to the sea. At first all commerce was carried on by barter and in return for large cargoes of this wood the chiefs received, in less value, trinkets, guns, ammunition, liquor, boats, silks and other Chinese goods. Great quantities of the costly goods, however, were never used but, being stowed away in unsuitable and insecure store-houses, were allowed to decay. In their greed for gain the chiefs, who had complete control over the common people, oppressed them sorely, compelling them to remain for months at a time in the mountains felling trees and bringing them down on their backs to the royal storehouses situated on the shore.

About the year 1810 Kamehameha I, king of Hawaii, is said to have received annually $400,000 for sandalwood and during the closing years of his reign and until 1825, the trade in this valuable wood was at its height. In 1829 the wood was becoming scarce and in 1835, the annual export had fallen off to $30,000. In the years from 1836 to 1841, it amounted to only $65,000, and soon after the trade in sandalwood seems to have come to a complete stop.

The cause of this rapid decrease and final termination was due to the un-

relenting chiefs who were guilty of the almost complete extinction of this valuable asset to the island forests. So harshly did they drive on the serfs in the gathering of the crop that these oppressed people destroyed also the young trees, in order that they and their sons might be relieved from toil, so heavy in the years to come. Shortly after, 1840, the chiefs suddenly realized their blunder and the taboo which they then put on the trees has saved for us a few species in the deep woods.

In India to-day a similar species, the *Santalum Album,* is successfully cultivated, under government control, and the supply of the wood is kept up by large plantations. The trees attain their maturity in twenty to thirty years, the trunk then being one foot in diameter. It is to be hoped that on the new forest reserves of Hawaii attempts will be made to restore the groves of this valuable tree and we may yet live to hear that the trade in sandalwood, grown in the Hawaiian Islands, has been revived.

FORESTRY IN NEW YORK STATE

BY

J. Y. McCLINTOCK

WHILE there are many persons who are scattered throughout the country convinced of the wisdom of establishing public forests, there are few in any one community knowing enough about the subject to form an intelligent opinion; and yet any action by the authorities in that direction must be sustained by public opinion. Therefore I desire to present some points in connection with the problem in New York State, and ask for an expression of opinion by this convention, knowing that it will have great weight with our citizens.

The people of New York have long been convinced that its forests should be preserved and that its hills and mountains which have been denuded should be reclothed with woods. Each political party favors it and there has been no adverse criticism of the expenditure made during a few years for the purpose of beginning the work.

The State is practically out of debt, and is being run without appreciable direct taxation. There are few places where intelligent forest operations will be beneficial to so large a number of people, or to so large an aggregation of invested wealth. It is impossible to explain why in the interest of the people the great Empire State, after making a good start in the direction of purchasing the forest lands, should suddenly stop, while that which it already owns is being neglected, and that which it will be necessary to buy, is continually advancing in price or being ruined by burning, after every growing tree has been removed by the wood alcohol and charcoal manufacturers, following after the lumbermen, tanners, and pulp men.

The subject has been treated in such a way, that the public are led to believe, that either the friends of forestry are not convinced by their own arguments, or that the department is not able to handle so large a business. The State began to buy forest land, and secured several hundreds of thousands of acres, at prices which seemed reasonable to all men conversant with the subject, and yet the appropriations were cut off and the work stopped. The State assisted in establishing a school of forestry the importance of which cannot be overestimated; and at the first

little puff of adverse criticism of its methods the appropriations were withdrawn and the school was closed.

The present State holdings of land are so scattered and intersperced with private holdings, that it is obviously impossible, at any reasonable cost, to apply intelligent forestry methods to them, or protect them from lumber thieves and forest fires.

It is probable that the land now owned by the state in the Adirondacks, about 1,250,000 acres, has a frontage of fully 10,000 miles upon private lots ranging in size from 40 acres to 90,000, whereas, if it was consolidated, the length of boundary might be reduced to 200 miles. When one remembers that but a very small part of this long line is plainly marked, and on one side of it is State woods or brush, and on the other side of it hundreds, if not thousands of men are cutting timber and wood and burning brush, it does not seem strange that the department is unable, with the appropriations available, to protect it.

The difficulty is also immensely increased by the provision of the Constitution prohibiting the cutting or removal of any trees from the State lands. When this was put into the Constitution the public did not have confidence in the forest officials, and the condition reminds us of the natural and divine law, that the sins of the fathers shall be visited upon the children, even unto the third and fourth generation. It is earnestly hoped that before many years the New York State forestry department will be organized on such a basis as to command the confidence of the community, to the extent of permitting the removal of this provision of the Constitution.

The time has come when the forest problem of New York State should be taken up boldly, and solved on the broadest scale. Every community and every citizen has a vital interest in it.

The protection of the sources of water supply to our cities, the increase of the value of our beautiful streams and rivers for navigation, development of power, and propagation of fish, the establishment of the most enjoyable health and pleasure resorts, within reach of the common people, and the permanent maintenance of countless industries, ministering to the need and comfort of all, depent upon the proper solving of this problem. The forest work should be spread over the entire State, so as to bring it in contact with the largest number of citizens, whose opinions and votes must sustain it.

There are sixty-one counties, in all of which, excepting five or six, there should be a State forest. In some it would cover the larger part of the county, while in others it might not exceed 1,000 acres. All lands not fitted for agriculture or profitable grazing, whether in the Adirondacks or the Catskills, or the foot hills of the Alleghanies, or on the shore of Long Island, should be under proper forest managment.

The watersheds where the water supplies for the great cities are collected, should, as far as possible, be covered with forests. While Philadelphia is expending huge sums for filtering its water supply after it has been contaminated, and other cities are forced to do the same, it appeals to our common sense that where it is possible, it would be better to collect the water from forest clad slopes rather than from highly cultivated farming land. For this reason the most attractive source for the additional water supply to New York is the Catskill region, where a great forest can be most advantageously established and maintained.

The city of Rochester which takes its supply from Hemlock Lake in Livingston and Ontario counties has expended hundreds of thousands of dollars in purchasing a strip of land all around the lake and has begun to set out forest tree seedlings to start a forest on its big plantation. It has

also started a protecting forest around its secondary reservoir in Monroe county. It will be found advisable to protect with more or less forest, Skaneatles Lake, supplying Syracuse; Conesus Lake, supplying Geneseo and Avon, and other lakes supplying cities.

Even in the rich agricultural counties, there will always be a local demand for wood and timber, and there are waste areas, and exhausted tracts, which could well be put into forests, for the purpose of supplying the local demands, and do away with the necessity of wood lots on each farm which are run usually in a wasteful manner and occupy too valuable land.

These small forests would afford the most attractive recreation areas for the neighboring localities, and after two or three generations they could be turned back to agricultural use, when new soil will have been formed. The plan followed in New York has been to confine the State forests to an area of about three and one-quarter million acres in the Adirondacks and a few hundred thousand in the Catskills. This should be enlarged so as to make the limit to be striven for, include all of the unimproved or forest land in the State.

This would comprise more than 10,000,000 acres of which about 6,000,000 would be in one great body, lying in thirteen counties, covering the Adirondacks, including Lake George, the west shore of Lake Champlain, Lyon Mountain, and excepting the lower Black river valley proper, include the great forest in top of Tug Hill, between the Black and Mohawk rivers.

Another great forest would comprise about 1,500,000 acres lying in five counties and covering the Catskills and Helderbergs, and still another would comprise about 1,250,000 acres lying along the southern boundary of the state in seven counties.

In addition to these there might be 1,250,000 acres distributed amongst thirty counties, in forests ranging in sizes from 2,000 acres in the rich county of Wayne to possibly 300,000 acres in Suffolk including the sandy shores of Long Island.

ECONOMIC METHODS IN RESTOCKING WHITE PINE FORESTS

BY

F. WILLIAM RANE

Professor of Horticulture and Forestry, New Hampshire College

THE white pine probably has played as important a part in lumbering interests as any tree that is indigenous to the country. As the primeval forests of this valuable timber are rapidly disappearing and hence, prices proportionately rising, the natural consequences are that problems of economy, not only in the use of the present supply but methods of renewal toward growing similar crops for the future are dawning. When anything reaches the stage that money valuations become stranded and of recognized importance we then have a basis for building financial structures. The greatest trouble in the past as regards forestry and its economic importance has been the problem of definite values. Today even pine box boards have a standard value of about $14 per thousand feet board measure in New England. Square edged boards of

fair quality did not bring more than this amount not many years since.

When the writer began the study of economic forestry as adapted to New England a few years since it was quite a perplexing problem. Nowhere could be found definite data or experienced foresters that could give the sort of information desired. Everything that has been published until very recently has been of a general nature and evidently not backed by results from actual forest work carried on in America. Even when requesting assistance from the Bureau of Forestry in carrying on experiments in restocking waste lands as late as 1901, information was received that such an undertaking was not practical. In the face of this discouragement and at private expense such work was, however, begun and has met with pronounced success.

In 1900 the writer endeavored to find out where seeds and seedlings could be purchased in quantity and at minimum cost. Two dollars a pound for pine seed was found a good average price, and three dollars a thousand for four to six inch seedlings was the lowest quotation secured, plus packing and freight charges. Nowhere in New England could seedlings be obtained at this time and for a few hundred thousand lots the or-

Digging White Pine Seedlings.

der went to Illinois. Think of its being necessary to send hundreds of miles to get pine seedlings, to the prairies of the West where they grow only in nurseries and hence artificially, when this tree is indigenous and propagates itself, it allowed to do so, in New England. One of our American foresters advocated purchasing pine seedlings direct from Germany as the most feasible plan at the time.

The amount of seed recommended by best authorities was five pounds per acre. The purchase of seedlings from Illinois proved as successful as anything that could approach an economic standard at the time. The idea of sowing ten dollars worth of seed on an acre of land that has a valuation ranging from fifty cents to five dollars was not considered practical. The transporation of seedlings from so far west has its drawbacks not only from the standpoint of extra expense but the risks in shipment, which are many.

After much study of forestry conditions and experimentation toward doing something that will be of actual economic benefit, especially in New England, I am convinced that results will be followed generally only where simple, well defined, tested practices have proven to be successful.

Upon careful examination the writer has found in different sections where the white pine is native, young natural seedlings in large numbers, and it is to emphasize the importance of utilizing these resources already at hand and to point out results from experiments in utilizing them that this paper has offered.

Seedlings of varying ages can be easily transplanted and be made to live if care is exercised and they are handled early in the season. Those we have found to be the most economical to use have been from two to four years of age. Data upon digging and transplanting these native seedlings at the New Hampshire College has been recorded at various times, but the best and most reliable information to offer is the cost of digging and transplanting 22,000 seedlings the past spring. Many of the students at the New Hampshire College help defray their expenses while attending the institution and it was these boys who did the work under the supervision of one of their own number, Mr. Wesley P. Flint, who is specializing in forestry. The work of digging was begun on April 18th and the seedlings were dug in various localities about Durham. The best method for digging was found to be by the use of the nurseryman's hoe, a two tined hoe resembling in some respects the potato digger. By the use of this tool one man can loosen about as many as two men can pull or pick up. One quick man can follow fairly well. These seedlings need a little care in lifting, however, after being loosened by the hoe. Where they have grown in sod ground as is often the case in the meadow at the edge of the woods one man can loosen as many as three men can pick up as they should be handled. It sometimes happens, however, where seedlings are growing in fine, deep, rich leaf mould, if gathered at the right season, they will come up as rapidly as one can pick them, so easily do they free their roots from the soil.

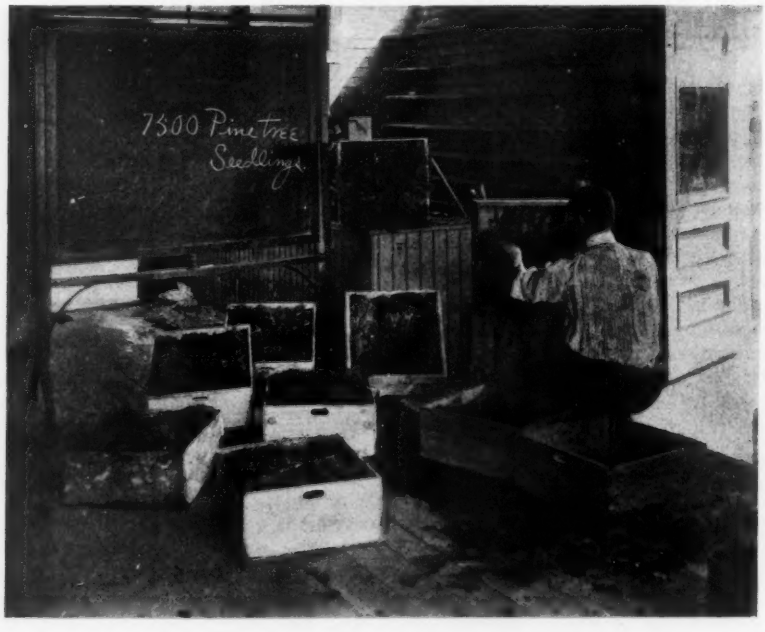
A man can hold about twenty-five trees in his hand easily and when this number has been pulled they may be put in small piles or baskets, protecting the roots from the sun. Averaging all conditions which varied from sod to those grown in leaf mould, each man averaged from 175 to 250 trees per hour. It is a safe estimate to say that seedlings of three years of age can be dug for about 75 cents per thousand.

Packing: Where the trees are not to be shipped of course this item of expense is not reckoned. Where they are to be shipped, however, the best method we could devise was to use the ordinary Boston market bushel box. As shown in the accompanying photograph, they can be placed flat-

wise in two tiers, the roots coming together in the center of the box where damp sphagnum moss is packed about them; or the box is placed on its side and the seedlings are laid one on top of the other, the roots toward the bottom. The bottom of the box is first packed with damp sphagnum. When the boxes are filled slats are nailed over the top to hold them in place. By the first method 600 trees can be packed in a bushel box, and there is little danger of their heating or drying out. If wet occasionally they have kept for several weeks thus packed.

The other method enables one to pack the seedlings much closer in the box and those thus packed averaged from 1,200 to 1,400 trees. The latter method of packing is the quicker, and cheaper, but not adapted for shipping long distances. For most purposes, however, it is the more practical as they will stand shipment for a week or even more thus packed before being transplanted. The cost of packing is nominal. If the seedlings are handled well when pulled and kept in bunches of twenty-five each with roots and tops together one man can pack ready for shipment, 20,000 in half a day. In the 22,000 dug no account was made in the packing, but all was included in the 75 cents per 1,000 as cost of digging and packing. If packed according to the first method named it would take twice as long as when stood up in the bushel box.

In transplanting the trees, if they are placed in pails which have some water in the bottom or better a thin solution of water and soil (puddled), this prevents the roots from drying out. In setting out, two men can work together to advantage, one using a spade or heavy dibble which is thrust into the soil and making a hole while the other follows with the seedling tree, placing the same in the open-



Packing White Pine Seedlings in Boxes for Shipment.

Starting the Young Trees on Their Journey After Packing.

ing and pressing the earth back firmly.

It was found that two men could set on the average about 400 seedlings per hour. Where it was easy digging and a friable soil this number could be increased, but when setting in a tough sod perhaps not so many could be handled. The number of acres set, therefore, will depend upon the distance they are set apart. When set 8x8 feet it requires 680 per acre and at a cost of setting, therefore, approximately, 50 cents per acre.

Taken together therefore the total expense of digging and transplanting amounted to only $1.25 a thousand. This low figure places the expenditure of restocking lands adapted to the growth of the white pine beyond question as an economic one.

When it is more generally known the writer feels confident that this simple and practical solution will be very generally practiced.

PURCHASE OF FORESTRY LANDS BY STATES AN INVESTMENT

BY

GENERAL C. C. ANDREWS

WHILE most of the forest in Europe is owned by individuals,, nearly all of the European states separately own and manage considerable forest land, though not of course in one body. Amidst, though not a part of, these forests, are occasional farms, villages, and many people. The forests are generally traversed by good roads. Prussia owns 6,000,000 acres of state forest, from which it derives an annual net revenue of $9,000,000. France owns 2,100,000 acres of state forest, from which it derives a net annual revenue of $1.91 per acre.

Why should the state own forest? Because on light soil, unfit for agriculture, it takes on an average about eighty years for pine forest to grow to merchantable size, and individuals will not engage in the business on a large scale.

In 1897 the Forest Commission of Wisconsin employed Dr. Filibert Roth, an able forest expert, to examine the northern part of that state with a view to inaugurating a forest policy. In an area of 18,000,000 acres, which had produced pine timber, he found 6,000,000 acres which he reported, "Not at all suited to farming, or only doubtfully so, and which should by all means be left to forest."

The area of land in Minnesota which has yielded pine is, in the aggregate, 18,000,000 acres, and it may be assumed there are at least within this area as many as 3,000,000 acres of rocky, hilly, or sandy land that is unfit for agriculture and which should be used for forestry. It may be asked if the state does not now own enough land? The State of Minnesota now owns about 2,500,000 acres of land, given by Congress, which by law it must sell, and for not less than $5.00 an acre, for school and state institution funds. Besides, the greater part of these lands are suitable for agriculture. They cannot possibly be taken for forestry.

Saxony has 432,000 acres of state forest, the annual growth in which averages 225 feet board measure per acres, so that 97,000,000 feet board measure can be cut yearly for revenue without impairment of the capital. At the same rate of growth the 3,000,000 acres in Minnesota should, in eighty years, when it becomes a normal forest, begin to yield 675,000 feet board measure annually, and which, at $5.00 per 1,000 feet, the present rate (the value will probably be double then), will be worth, standing in the woods, $3,375,000 as net revenue.

In Germany, each 100 acres of forest gives steady employment to one workman, who lives in or near the forest with his family. He has skill and training, and, to be contented, must have good wages. In the same proportion, our 3,000,000 acres of Minnesota state forest would give steady employment to 30,000 workmen, who would represent an orderly population in the forest of 120,000. Among other indirect benefits, the forest would promote water supply in streams, beautify landscape, fertilize soil, ameliorate climate, afford covert for game.

One of the richest pine timber regions of the northwest was the Saginaw and Huron Shore district of Michigan. In 1893 there was cut in that district 858,000,000 feet of pine; but the supply of pine timber had so

diminished during the next ten years that in 1903 only 52,000,000 feet were cut.

The remaining original pine timber in Minnesota will be cut within the next fifteen years. There is some new growth coming on, and, while pine will always be cut in Minnesota, the great logging industry which now employs 15,000 men every winter will suffer a great decline.

The population of the United States increases 18 per cent every ten years, and the population of Minnesota increases more rapidly. The demand for forest products will increase. The Commissioner of Statistics estimates that there are in this state 12,000,000 acres of arable land not yet under cultivation. Cheap lumber will be an important factor in developing this land.

In 1897 the State of New York owned about 1,000,000 acres of forest in the Adirondacks, since which time it has purchased, through its Forest Commission, mostly in the Adirondacks, but partly in the Catskills, 437,000 acres more, for which it paid $1,697,448, being an average of from $2.56 to $4.26 per acre. January 1, 1903, it held 1,436,686 acres of "forest preserve." There remain 1,200,000 acres of forest land in the Adirondacks, which it is expected the state will acquire for $2,000,000.

The Forestry Commission of Pennsylvania has purchased 700,000 acres of forest land at an average price of $2.75 per acre, and is continuing the work. The purchase of land for forestry in both these states is properly regarded as an investment, and not as an expenditure.

The legislature of Minnesota, of 1903, authorized the Minnesota State Forestry Board to purchase land within the state, adapted for forestry, at not exceeding $2.50 per acre, and preferably at the source of rivers, and to maintain forest thereon according to forestry principles, but appropriated no money for the purpose. It would be wise policy for the present legislature to make a suitable appropriation to commence this work.

BEST USE OF WASHINGTON'S STATE SCHOOL LANDS

BY

FRANK H. LAMB

THE man who squanders his own money suffers for his acts—he is rated a fool.

The manager who allows the assets of a corporation to become dissipated is soon discharged from the service of the company. He is a business failure.

The trustee of the legacy of a widow and minors who does not properly husband the properties entrusted to his care incurs the censure of the court and the everlasting anathemas of the wife and children.

The men who are not true to any great trust imposed upon them for a specific purpose, wrong and injure not only the grantor and grantee of the trust, but if it be a public trust, injures the public, not for the present only but for all time.

The people of the United States through its representatives—Congress—granted to the people of Washington for all time for the support of the schools of the state certain tracts of the public domain. At the time of that grant the State of Washington contained less than 350,000 inhabitants.

Farm values were only about 25 per cent of what they are to-day. The value of stumpage or standing timber was practically nothing; it was a nuisance, an impediment to settlement of the land by farmers. These lands were granted to the state as a trust, the revenues from which were to be used for the support of the various institutions endowed. The legislature of the state is the trustee of that trust. It is a trust granted by the people of the United States to the people of Washington for the use of the school children of the state for all time to come.

Can it be supposed that Congress ceded these lands to the state expecting it to act as a broker or agent to immediately realize upon them by sale? Did the people of the United States suppose that Washington would sell these lands, as were the 64,080 acres of the original territorial grant to the state university, at $1.50 per acre? Did Congress expect or intend that the State of Washington would sell the birthright granted to the school children of the state for a "mess of pottage," or was it the intention of Congress to make this grant to the new state, believing the people of the state would have a proper regard for the welfare of the school children and see that these lands were properly protected and managed and the resources husbanded so that the greatest possible annual return might be placed in the various funds?

Suppose the trustees of that magnificent institution, Girard College, had, upon the acceptance of their trust, disposed of the real estate holding of Stephen Girard, located in the city of Philadelphia, and many of which were apparently without any great value, for what they could have secured—do you think that the original endowment of $1,000,000 would have grown to the enormous capital of $30,000,000, the revenues of which that institution now disposes annually to orphan children? Suppose these trustees had not taken any steps to build up these properties, to develop their latent resources—had allowed fire to destroy them—would Girard College be the second richest institution of learning in the world to-day?

The Legislature of the State of Washington is as much a trustee of the common schools as is the trustee of any other institution or the guardian of the person and property of the lone widow or helpless orphan children. Is it then not right that it should devote as much time, attention and conscientious business ability to the care and management of these lands as would any other trustee or business man?

SCHOOL LANDS GRANTED AND NOT DISPOSED OF.

The area of these grants and the acreage, not disposed of by sale, lease or contract, is as follows:

Name of Grant.	Original Grant. Acres.	Area not Disposed of. Acres.	Pct.
Normal Schools.....	100,000	68,428.29	.68
Agricultural College.	90,000	60,671.91	.67
Scientific School.....	100,000	85,275.15	.85
Chart. Educat., Penal and Reform Insts..	100,000	88,923.08	.88
University, original..	46,080	587.29	.012
University Sub. grant	100,000	64,860.40	.65
Capitol.....	132,000	113,948.51	.86
Common Schools, Secs. 16 and 36, estmd...	2,250,000	1,353,958.00	.61
Totals.....	2,918,080	1,836,653.63	.625

There has been received from sales and leases of state lands in the past twelve years a total of $5,140,254.82. This has been derived from deeded sales of .027 per cent of the state's lands, or 78,837.89 acres at an average of $16.68 per acre; from sales by contract of .023 per cent of all lands or 68,368.47 acres at an average of $19.83 per acre; and from lease of a total of 30 per cent of all state lands, or 888,-651.38 acres, at an average annual rental of 14 cents per acre.

THE STATE TIMBER LANDS.

It is safe to presume that, of the state lands, those lying east of the Cascade Mountains include but little merchantable timber, while those west of that divide were selected mainly for the value of their timber.

The area of school lands originally granted, in each county west of the Cascade Mountains, is as follows:

County.	Acres Common School Lands.	Acres Granted Lands.	Totals.
Whatcom.....	27,631.00	1,512.23	29,143.23
Skagit.....	31,123.00	12,158.58	43,281.58
Snohomish....	36,921.00	6,666.32	43,587.32
King.....	48,251.00	24,135.84	72,386.84
Kitsap.....	17,909.00	1,120,00	19,029.00
Clallam.....	48,385.00	36,251.19	84,636.19
Jefferson.....	22,648.00	51,843.15	74,491.15
Chehalis.....	51,759.00	13,053.59	64,812.59
Mason.....	22,001.00	18,942.14	40,943.14
Pierce.....	27,016.00	15,135.10	42,151.10
Thurston.....	22,291.00	3,391.80	25,682.80
Pacific.....	35,636.00	20,236.54	55,872.54
Wahkiakum...	7,745.00	17,107.76	24,852.76
Lewis.....	62,564.00	16,861.37	79,425.37
Cowlitz.....	38,661.00	35,469.24	74,130.24
Clarke.....	22,736.00	11,695.61	34,431.61
Skamania.....	15,189.00	15,987.38	31,176.38
	538,466.00	301,567.84	840,033.84

The area of the common school grant has been computed from the plats of the surveyed townships in each county with indemnity selections added and all sales to date deducted.

In the timbered counties above enumerated the state will receive for its common school grant, when all the lands are surveyed, approximately 847,360 acres. Any loss due to forest reserves, etc., can be selected in lieu lands elsewhere.

Taking the strictly timbered lands, it is the opinion of all timbermen that they are worth to-day, at a minimum valuation, $10 to $15 per acre, or $8,400,000 to $12,600,000—certainly a most munificent endowment for our schools. Yet the aggregate sales of timber bills of sale issued in the past four years, comprising over 67,000 acres, has only averaged $8 per acre for the timber, separate from the land.

WHAT CAN THE STATE DO WITH ITS TIMBER?

Only three plans have been suggested for the management and disposal of the state timber lands:

First. To retain absolutely all state timbered lands for a period of years.

Second. To allow the state land commissioner full discretion and power to sell any or all of these lands in fee simple at any time.

Third. To sell only the timber from the state lands and then only as needed, with the condition that it be removed in a limited period.

If the state reserves from sale absolutely all timber lands it will lose all the timber standing on such portions of them as come within the scope of logging operations.

Over 60 per cent of the state lands are comprised in sections 16 and 36 of each and every township in the state. It is impossible in logging to avoid these sections. The logger is not going to allow the fact that one-eighteenth of the land is reserved by the state to deter him from beginning logging operations in any locality.

When these lands are reached and become accessible in the course of ordinary logging operations, if the state does not realize upon them it never will. With the surrounding lands cut over, fire will run over these isolated sections with each recurring season until little of value remains. Furthermore, if they escape the flames, the logger may in a few years cease his operations in that vicinity. Track and equipment reaching in value into hundreds of thousands of dollars will be removed and it will be financially impossible to ever replace them in order to reach these isolated school sections lying four miles from each other.

If an ironclad law is enacted and maintained reserving the state timber lands, the state would eventually get absolutely nothing for its timber inheritance.

Is this the policy a business man would adopt? Does the large timber land owner hold his scattered lands in the face of such conditions?

Were the state to offer its lands indiscriminately for sale to-day it cannot be denied but that in a very short time they would be absorbed by private owners. If an absolutely honest sale such as a business man would make should be made by the land commission, these lands might realize $10 per acre, or over $5,000,000. Certainly a mere pittance for the permanent endowment of our state schools. Companies owning large bodies of timber

lands would be forced to have these state lands appraised and they would buy them in to protect their other ownerships. As long as the state holds these lands no party has the advantage, but with an open market each dominant owner in any one locality would be forced to take in the school lands. While competition in their purchase would be nominally open to all, yet practically only those who own the major portion of the other eighteen sections or who already controlled the means of exit could bid anywhere near their real value.

Realizing as all must that the increase in realty and stumpage values is far greater than the interest upon the returns, if sold at a portion of its value, it follows that the state should not dispose of one acre of the timber lands that prudent considerations do not indicate as absolutely necessary. No timber should be allowed to burn up or to be left where it can never be reached because the state is bound by a law prohibiting its sale.

To get, therefore, a proper return upon the trust, there is only one method. That is to sell the state timber only as it becomes accessible in the course of ordinary logging operations and separate from the land. The sole objection claimed to this is that a full value for the timber is not always realized. This is an impeachment of the state land office officials, since no timber can be sold except at the value appraised by the state board of land commissioners. And, further, the constitution provides that no land can be sold at less than $10 per acre. Give to this law a proper, businesslike administration and the state will sell each year less than 3 per cent of the timber holdings of the state and then only where sale is necessary to prevent loss, and to the operator who can well afford to give its full value.

KEEP THE LANDS AND GET ALL THE VALUE FOR THE SCHOOLS.

No matter what disposition is made of the state's timber, it is against the dictates of prudence to sell the title to any state lands not valuable for agricultural purposes.

When the timber is removed from these lands they are considered of no value. The owner, rather than pay taxes, allows them to revert to the county. They contribute nothing to the revenues.

These lands have a value. You who have seen the cut-over lands of Maine, New York, Michigan, Wisconsin, allowed to revert to the state for taxes, and then have seen the refuse timber or other materials of value on these lands so increase in value that the second cutting has realized more than the first, can readily see that in course of time our schools will surely reap from these lands returns often exceeding those from the cut of the virgin timber. Should this value inure to those who juggle with the county delinquent lands or to the state school funds, of which the state was created trustee? What would you, as a business man, do?

Nature is kind to us here in Washington. No sooner is land cleared than a new growth of timber starts up. It may be fir, hemlock, spruce or cedar. It is all valuable. In ten years Washington's stumpage has increased in value from 50 cents to $1 per 1,000. Michigan stumpage is now worth from $5 to $9 per 1,000 feet. The cut of the middle west has been declining for five years. The timber of the south will only maintain the present rate of cut for about ten years. Wait ten years, and the State of Washington will come into its inheritance. Knowing these facts, would not a trustee be criminally negligent who did not realize the greatest value from its trust? Would any sane business man sit idly by and see such a property dissipated or burned up by fire?

THE STATE MUST PROTECT ITS TIMBER FROM FIRE.

With property valued at from $10,000,000 to $15,000,000 at stake, the agents of the people have not appropriated one dollar for its protection. Each succeeding summer our skies

have been clouded and our magnificent mountains obscured by a mantle of smoke. Thousands and thousands of dollars of school property have been destroyed, not to mention the millions of dollars of private property, by that demon—the forest fire; and the only effort made has been the passage, in 1903, of a fire protection act that constitutes the county officials fire wardens, without funds, without adequate compensation, without power to enforce the provisions of the law. How long would a great business organization of over twenty departments exist that had no guiding and responsible head?

What was made every one's business became no one's business. If county commissioners wished, they did nothing; after the first year few of them moved a hand. Some county attorneys refused to prosecute open violators of the law.

In the State of Oregon, where the legislators of that state sold their school land trust for the traditional "mess of pottage," or at a price of $1.25 to $2.50 per acre, the governor of that state, in his annual message, having in the previous session vetoed a forest fire bill, stated that, since the state owned practically no lands, he would not vote one cent to protect the timber lands of private owners. Is that the attitude of a sane man? Is that the attitude in cities? Do they not employ firemen and all conceivable precautions and appliances to prevent the destruction of private property?

In the State of Washington the best estimates show that there is still standing about 175,000,000,000 feet of timber. If this timber was logged to-day the stumpage would be worth about $1 per 1,000, or $175,000,000. This is the return the private land owner would receive if it was placed on the market to-day; but see what the people would get from this:

Labor for logging, average $4 per 1,000	$700,000,000
Labor for sawing into lumber, average $3 per 1,000	525,000,000
For transportation to markets of world, $7.50 per 1,000	1,212,500,000
Total	$2,437,500,000

Where, then, is the interest in this timber? Only 7 per cent in the land owner, 93 per cent in the people for its logging, manufacture and conveyance to market.

The following is a comparative statement of the importance of the chief industries of the state as shown by the annual production of each (the figures are from the United States Census Report):

COMPARISON OF WASHINGTON INDUSTRIES, CENSUS OF 1900.

Total value of food and kindred products	$19,904,566
Total value of all farm products	29,618,455
Value of all iron and steel manufactures	2,592,946
Value of all metal and metallic products, other than iron and steel	4,867,672
Value of Washington fisheries for 1890	934,940
Total value of lumber and lumber products	32,400,258

In the session of 1903 the legislature devoted to the protection and advancement of these different industries the following amounts:

FISHERIES.

Fish Commissioner's office	$24,000
Fish Hatchery Fund	122,865
	$146,865

AGRICULTURE.

Grain Inspectors	$5,600
Horticulture Commission	10,000
State Dairy and Food Commission	6,600
State Agricultural College	158,000
Grain Inspection Fund	35,000
	$217,200

MINING.

Coal Mine Inspector	$4,250
Commissioner	1,800
	$6,050

These appropriations were necessary and were to the interests of the whole people. The state owns vast bodies of farm lands, but it does not own title to the fish or to any minerals, as such lands are reserved by the United States; but it owns $10,000,000 to $15,000,000 worth of timber, which in ten years will be worth double these figures. Yet it did not appropriate one dollar to protect it from fire when it is a well-known fact that each year large tracts of state timber are destroyed. Scattered as they are in every township, there is no forest fire of any consequence that does not reach state timber, and in several localities where selections have been made, great bodies

have been destroyed. In Cowlitz and Clarke counties, in one fire 200,000,000 feet of state timber were destroyed. Here the state lost $200,000, and this is only a single instance.

This legislature has in its power to create here in this great commonwealth a school fund of magnificent proportions that will very materially aid in the establishment and maintenance of our educational institutions, that will become a pride to the state, a boon to every school child in all the years to come. No burden is so heavy, yet so willingly borne, as that of proper school facilities. Here you have the power to aid the taxpayer by managing these lands as would any trustee to the end that the greatest returns for the greatest time might flow into the school funds. To do this:

First. Reserve title to all school lands not suitable for agriculture.

Second. Sell only such timber separate from the land at its full market value, as it is necessary to prevent it from destruction, and as is necessary in the course of ordinary logging operations.

Third. Enact a law that will guard the virgin timber of the uncut lands and the young growth of the cut-over lands from fire so that they may not become a blackened, desolate waste of no value, but, instead, lands that will each year grow into greater value to the increase of the school fund trust.

The opportunity and responsibility for giving the state lands proper protection lies with the present legislature. Up to this time not a single word has been said on the subject in either house or senate. Those people whose timber is burning up every year through official inaction, those who wish to see Washington the very foremost state in educational equipment; every parent, every school child, should see that this subject is taken up this session and the legislature made to protect the school trust imposed upon it.

THE GILA RIVER FOREST RESERVE

THE Gila River Forest Reserve, which was established by proclamation of President McKinley on March 2, 1899, was examined in the summer of 1903 by Mr. Theodore F. Rixon, of the United States Geological Survey. Besides examining the lands Mr. Rixon made a rough survey of the area and prepared a reconnaissance map.

The reserve includes several prominent mountain ranges, the principal of which are the San Francisco, the Tularosa, the Mogollon, and the Black. The southwest corner of the reserve is, generally speaking, a rolling country with many prominent buttes, and is without trees except a light growth of scrub timber in patches. The extreme southwestern portion, in which Mount McMullen raises its barren summit, is very rocky and abrupt. Here the country drops perpendicularly several hundred feet into a desert tributary to San Francisco River, which lies distant 20 miles or more to the west. The reserve as a whole is well watered, all the streams from the mountain ranges carrying a considerable flow for a long distance beyond the forest regions. It is traversed by fairly good roads and trails, which follow the valleys.

Agriculture is carried on extensively along San Francisco River and there are a few farming settlements along Gila River, but no large agricultural area exists anywhere within the confines of the reserve. By introducing reservoirs and irrigating ditches the amount of available agricultural land could be largely increased. The market for the products of this distrist is so distant, however, being in

no instance less than 90 miles away, that a system of irrigation would hardly pay for itself.

Grazing, the most important of the industries of this region, requires careful attention and supervision to prevent the total destruction of the grass roots by overstocking. The mining industries in the reserve are confined to the Mogollon Mountains and practically to the Cooney mining district, although a few prospects are found on South Fork of Whitewater Creek. The advent of railroad facilities would undoubtedly bring the district to the front, but there is little prospect of that in the near future, as the territory is practically unproductive agriculturally and the only freight available would be the ore from Cooney district.

Logging operations have been carried on in a desultory manner for some years in different parts of the reserve. Wherever the yellow pine has been logged clean, the young growth on the lower lands is inevitably yellow pine, which is growing very rapidly in places. The young growth throughout the alpine and mountainous regions is white fir, red fir, limber pine, spruce, and balsam, and the proportion of reproduction is in the order named. At the lower altitudes the second-growth timber is very limited. However close their proximity to streams, the different species of cottonwood, walnut, ash, alder, box elder, and sycamore reproduce themselves to a limited extent only, mostly in shady places along deep, rugged canyons. All of these varieties are indigenous to the soil, and grow freely wherever there is sufficient moisture. The depth of humus is slight, the lowlands being entirely devoid of it. The litter and the underbrush among the alpine timber are very heavy. This reserve has suffered very little from fires.

If the totally barren area is not taken into consideration, the Gila River Forest Reserve is a well-timbered region. The total area examined is about 3,640 square miles. Of this, 2,593 square miles, or 71¼ per cent., are covered with merchantable timber of extra quality; 2 square miles have been burned; 90 square miles, or 2½ per cent., have been logged; and 955 square miles, or 26¼ per cent., are naturally timberless. The timber of the reserve amounts to a total of 5,867,169,750 feet B. M., giving an average stand of 3,532 feet B. M. per acre over the entire timbered belt. Yellow pine constitutes 57.75 per cent. and red fir 28.37 per cent. of the merchantable species in the reserve.

RAILROAD TIES OF LOBLOLLY PINE

The Bureau of Forestry Finds Out How to Economize in Their Production

A GOOD example of what is being done along the most practical lines by the Bureau of Forestry is furnished by the results of a study of loblolly pine in east Texas which it has recently made. Vast quantities of loblolly pine exist in the Southern States, some of which is sold on the market as shortleaf yellow pine. The wood of loblolly pine is inferior to that of longleaf and of shortleaf pine, partly because of the rapidity with which it decays when exposed to the weather or in contact with the soil, but for many purposes it answers just as well as the more valuable species. It is certain to increase greatly in commercial value and its use is now extending rapidly. As the longleaf and shortleaf pines become scarcer and higher in

price loblolly is sure to replace them to a great extent; this study of its uses is therefore very timely.

One of the chief purposes for which loblolly is now used in the Gulf States is for railroad ties. The wood is not durable and the tie in its natural state is short-lived, but by preservative treatment it can be made to resist decay for a number of years. The discovery that treated loblolly pine is an excellent substitute for longleaf for railroad ties is greatly to the benefit of the railroads since it enables them to use a less expensive tie. It also benefits the country at large by cutting off one of the heavy demands made upon the longleaf forests and thereby setting free a corresponding amount of that material for the general market.

In making loblolly pine ties there are many wastes and the drain upon the existing forests is greater than it need be. The recent study was therefore made for the purpose of showing the rate of growth of the trees, and how ties could be produced more economically.

Loblolly pine is found in commercial quantities in ten counties of east Texas, where it covers an area of nearly 2,880,000 acres, and is hewn into cross-ties on a larger scale than in any other State. The magnitude of this industry results from an abundant supply of loblolly pine of sizes suited for pole ties. It is estimated that from 75 to 80 per cent. of the present loblolly stand in Texas is timber of tie size, the remainder being large enough for lumber. The preponderance of comparatively young and small timber is due principally to severe storms in 1865 and 1873 which overthrew the old pine on many thousands of acres and established new stands of young trees.

Loblolly is adapted to a wider range of soils than any other pine in east Texas. This, with its frequent and prolific seeding, its rapid rate of growth, and its immunity from hogs which eat the roots of the young longleaf pine, enable loblolly pine to reproduce readily on denuded land. In many situations it competes successfully with longleaf pine and comes up under hardwoods if the stand is not too dense, and rapidly outgrows them. The conditions in east Texas are most favorable to this species; it is sure to increase in commercial importance and may become the principal source of timber supply of the region.

Three counties in east Texas—Orange, Jasper, and Newton—furnish annually from 1,000,000 to 1,500,000 hewn loblolly pine ties. The trees cut for ties vary in size from 11 to 17 inches in diameter, measured breast-high. The hewers prefer diameters of 12, 13, and 14 inches as the smaller the tree, above tie specifications, the less the labor in squaring it. The largest number taken are 13 inches in diameter. This practice is very wasteful, for the average tree 11 inches in diameter is about 35 years old and is growing rapidly. The average yearly increase in value between 11 and 13 inches is over 7 per cent., and from 13 to 14 inches 5.5 per cent. After the latter size is reached growths falls off so fast that for the next inch of growth the increase averages only 2.5 per cent., and at 16 inches the value for hewn ties ceases to increase.

These facts point out the rule which the owner should follow in selling trees for ties. Those 11, 12, and 13 inches in diameter are growing so rapidly both in size and value that to cut them consumes the capital that is bringing him the best rate of interest. The tie maker should be confined to 14, 15, and 16-inch diameters. Trees above 16 inches should be preserved until they can be profitably felled for lumber.

The adoption of this rule will be best for the owner and for the productive future of the forest as well. It will however necessitate a complete change in the method of getting out ties as they will have to be sawed instead of hewed. But this too would be a gain for both owner and forest.

since hewing is a very wasteful method of tie production. Under it many of the larger trees are cut with unnecessarily high stumps in order to save labor in hewing down the butts. In many other cases the trees are not used as far up into the tops as they might be. Further, the hewing process itself is very wasteful and leaves in the woods a quantity of litter in the shape of slabs and chips in which fire is often started and the forest seriously damaged.

If hewing is continued it would be unwise to restrict the cutting to 14, 15, and 16-inch trees for that would involve increased waste, but the value of the smaller sizes demands this restriction, and sawing should take the place of hewing. When the larger logs are sawed several boards can be obtained from the wood now wasted in slabs and chips as the hewing progresses.

There is still another form of waste resulting from hewing. In grading ties the railroads are very strict about accepting none under specification sizes, but they do not object to some excess in size. This, and the fact that less labor is required to produce large ties, has induced hewers to make many ties larger than they need be. This is a small matter in the case of each tie, but as they are cut by the million the excess represents in the total a very large waste of wood. It means also an unnecessarily great consumption of creosote or other material used in the preservative treatment, since the total bulk of wood which must be treated is greater.

It is estimated that from 48 to 70 per cent. of the timber cut for pole ties goes into chips, slabs, and excess over the maximum dimensions required. Adding all causes of waste it is found that the percentage of timber actually used in hewn ties is no more than 25 to 30 per cent. of the total volume of the trees felled.

Loblolly pine grows so rapidly that two crops of pole ties can be produced in less time than is required to grow one crop of longleaf pine ties, and from each of the two crops there will be a larger average yield of ties. This tremendous advantage of loblolly pine is increased by the marked ability of the tree to reproduce itself. Conditions in east Texas are almost ideal for the maintenance of forests of this tree, and the opportunity to earn good returns by their conservative management is equalled in few parts of the country.

LIGNITE OF NORTH DAKOTA AS APPLIED TO IRRIGATION

UNDER the direction of Mr. N. H. Darton, of the United States Geological Survey, who is making a general investigation of the underground-water resources of western United States, Mr. F. A. Wilder has recently examined the lignite deposits of North Dakota and studied their relation to irrigation.

The areas most favorably situated for irrigation in North Dakota are the broad terraces along the Missouri and its tributaries. These streams are deeply intrenched, and it does not seem possible by means now available to raise water from them a vertical distance of 150 to 400 feet over the bluffs that rather sharply bound the broad valleys.

The fertile terraces in the valleys of the streams range from 15 to 100 feet in elvation above water level. As there is an abundance of lignite along these streams, it has seemed desirable to consider the possibility of irrigating the 250,000 acres included in the terraces by pumping water directly from the rivers, using lignite as a fuel. To

this end the lignite area has been studied and the lignite beds investigated. Practical tests have been made to ascertain, at least in a rough way, the cost of irrigating river flats which are less than 100 feet above the streams. The Missouri and its tributaries in North Dakota have been followed, and the extent and elevation of the river flats and the amount and quality of the lignite near them have been noted.

If only a small fraction of the western part of the State is under irrigation the productiveness of the whole region will be greatly increased. With a few acres which can be watered at will, and abundant range of cattle in the broken or rolling land back of the valley, ten families, by combining farming with cattle raising, will prosper where one finds a living now. These conditions will lay a sure foundation for the dairying industry, which should be one of the foremost of the State.

The only workable beds of lignite east of the center of the State are in the Turtle Mountains and at the southern bend of the Sheyenne River, about 25 miles southeast of Valley City. The region in which discoveries of lignite might reasonably be expected may be roughly bounded on the east by a line beginning at the northern boundary of the State, 30 miles east of the Minneapolis, St. Paul and Sault Ste. Marie Railway, and extending southeast to Harvey, thence south through Steele to the southern boundary. On the north, south, and west the lignite continues beyond the boundaries of the State. This region is of very great extent, having an area equal to half that of the State of Ohio. The extent and thickness of these lignite beds are discussed in detail by Mr. Wilder. The lignite output of the State amounted in 1902 to 315,800 short tons, valued at $428,270.

Judged by ordinary standards the lignite is very inferior. Its fuel value has been determined analytically, and the results of the chemical, calorimetric, and practical evaporative tests by which it has been examined are described by Mr. Wilder. The subject of pumping water by means of power plants supplied with lignite fuel is discussed by Mr. Charles S. Magowan.

Mr. Wilder says in conclusion that opportunities to reclaim arid lands appear to exist in the larger flats on Missouri River. In choosing a flat where reclamation by pumping may be tried under most favorable conditions, a number of factors must be kept in mind. Nearness to a railroad and a market are as essential as an abundance of cheap fuel and good land. An active interest on the part of the resident owners is necessary. Some of the lignites from partially developed but extensive deposits in North Dakota and Texas, when tested in the gas producer and gas engine, have shown unexpectedly high power-producing qualities, such as promise large future developments in those and other States. Some of the American coals, and the "slack" produced in mining these coals, can be briquetted on a commercial basis.

THE RECLAMATION SERVICE

News of the Government Irrigation Work--Progress of Old Projects and Plans for New Ones

Want Sun River Project Completed.

The Director of the Geological Survey has received a memorial bearing the signature of 226 citizens of Great Falls and Cascade County, Montana, calling attention to the importance of early action by the Department on the Sun River project. The memorial, in part, is as follows:

"Realizing full well the benefit that the State of Montana will derive from the execution of the provisions of the National Irrigation Act, and knowing as we do the great interest you have taken in carrying out the provisions of this law, we desire to say that the people of Great Falls and of Cascade County, Montana, heartily endorse your actions and work and write this letter to express to you our appreciation of the great work you are doing in Montana and especially in connection with the Sun River irrigation project.

"As you know, the land to be reclaimed by this project is a broad prairie extending from the Teton River on the north to the Sun River on the South, a distance of thirty miles, and from the Rocky Mountains on the West to the Missouri River on the East, a distance of seventy miles. This land, although extremely rich in all the elements of fertility, without water is only fit for grazing, but when irrigated its productiveness cannot be surpassed anywhere in the United States. The preliminary survey of this project has been made and we are reliably informed that the engineers of the Reclamation Service estimate that not less than three hundred thousand acres of cultivable land lying between the Teton and Sun Rivers (much the greater portion of which is still Government property, a fact that cannot be advanced in favor of any other project in this State) can be reclaimed with the waters of the Sun River.

"Such being the case, from which it is apparent at a glance that at least twice as many people can be supplied with homes thereunder than is possible to be accommodated under any of said other projects, with a like expenditure of money, the only logical deduction that can be made therefrom is that the Sun River project, on good sound business principles, if on none other, should be the first constructed in Montana under the National Irrigation Act. And even now, there are thousands of people anxiously watching and waiting for the Government to reclaim the land above described in order that they may build for themselves homes upon what is now practically a desert waste, but which will, under the magic touch of irrigation, yield rich rewards to the industrious husbandman, and this Sun River project presents a splendid opportunity for the Government to show to the people what can be done by the Reclamation Service in the way of making homes for settlers.

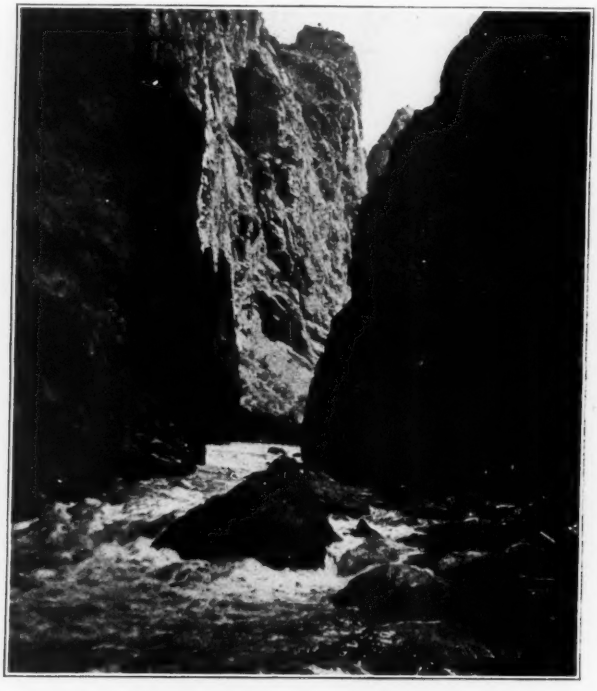
"The purpose of this letter is to express to you our great anxiety for a very early completion of this Sun River project and to say to you that we, as citizens, are ready and willing to assist you in your great efforts, and also the engineers, in any way possible, to further this project. We will at the proper time, if you so desire, take it upon ourselves to solicit and obtain contracts for water from the prospective settlers. The Great Falls Commercial Club, the members of which have hereunto subscribed their names, hereby agrees to assist in every way possible this great work, and we respectfully ask that you will use your influence to the end that the Sun River project shall be the first undertaken by the Government in this State."

Pumping for Irrigation.

The large percentage of irrigable land throughout the West lying at heights too great to be reached by gravity systems, presents a problem which can be solved only by the use of pumping plants, and the engineers of the Reclamation Service have been making investigations and working up estimates on several projects to determine the feasibility of their use in connection with the Government irrigation works. The most important and variable factor to be considered is the cost of power and of operating the plant.

In many cases water power may be developed as an incident of the construction of dams for storage and diversion, or in canals where the nature of the country requires the water to descend suddenly to a lower level, making the additional cost for the power little more than the expense of erecting the necessary buildings, water wheels and generators. In many sections water power may be developed in the mountains or at falls, and transmitted electrically to lands some distance away where the water is to be pumped and used.

The high rates charged for power by commercial electrical companies have not been found prohibitive in many sections of the West where the value of the crops to be irrigated is relatively high, or where the water to be pumped is only to augment the main supply during dry periods. In the case of national irrigation works minimum costs may be expected from the fact that no interest is charged by



Site of Proposed Dam, Gunnison Canyon, Colorado.

the Government on the money advanced for installing the plant, and the item of profits involved in commercial enterprises will also be eliminated.

In many sections of the West, however, water power possibilities are not present, and it becomes necessary to locate a cheap fuel supply for the production of steam power. Coal and oil are found in many parts of the arid region, and aften may be delivered at the pumping plants at very low cost. Western coals are, as a rule, poorer steam producers than coals from the Eastern or Middle States. Tests to determine the relative evaporative powers are now being made by the United States Geological Survey at tS. Louis, and the data obtained will be reliable and important for comparing the steam producing qualities of varieties of coals from all parts of the United States. The results of various commercial tests indicate that under similar conditions one pound of the bituminous coal of Pennsylvania or West Virginia will evaporate about 10 pounds of water into steam; one pound of Illinois or Missouri coal will evaporate about 7 pounds of water into steam; and one pound of western lignite, about five pounds.

Typical View of Gunnison Canyon, Colorado.

Many grades of coal besides lignite are, however, found in different sections of the West, Colorado alone producing coals ranging all the way from lignite to anthracite. On account of the extreme variations in the kinds of western coals it is just as important to know the steam producing power of the coal to be used as its cost per ton, in order to estimate closely the

probable cost of the fuel for a given pumping plant.

Crude oil burned under steam boilers is an ideal fuel when its cost is not too high, and the small gas engine in its many forms and types is one of the best means of obtaining power for irrigation in units up to as high as 30-horse power. The possibilities of utilizing in an economical way any kind of fuel available for pump engines are deemed worthy of consideration by the engineers of the Reclamation Service.

Estimates of probable costs of power and pumping plants necessitate a knowledge of all the factors peculiar to each project; for instance, the duty of water, materials for construction which can be secured locally, the character of the water to be pumped and of the ground on which the plant is to be built, the type of plant peculiarly suited to the various conditions, etc. On projects where oil, coal or other fuel furnishes the power for pumping, it has been suggested that each water user be required to pay for the amount of water actually delivered to him, since the operating expenses will depend so largely upon the quantity of water pumped. This would tend to foster economy in the use of water and the annual expenses of the water-user could be adjusted from year to year to correspond with the varying quantities used, depending upon whether the season is wet or dry. A minimum annual payment per share would cover the fixed charges for keeping up the plant.

Want Nevada Underground Waters Investigated.

Governor Sparks, of Nevada, has transmitted an assembly memorial and joint resolution through the Secretary of the Interior to the Director of the Geological Survey, relative to Federal aid in the development of artesian and subterranean sources of water supply in Nevada.

The memorial recites that there are several million acres of land within the State of Nevada, at present lying idle, uninhabited, and of no assessable value, the general government estimating this area at 20,000,000 acres of agricultural lands and 30,000,000 acres of grazing lands, with only a small portion of the same under cultivation or occupied for grazing purposes, owing to the absence of water. A supply of water for irrigating purposes would render these lands very attractive, and situated as they are in a favorable climate, with soil susceptible of the highest cultivation, would greatly increase the population of the State and become a source of revenue to the Government.

The memorialists believe that an abundance of water can be obtained to reclaim large tracts of the arid lands within the confines of the State, but owing to the fact that the title of these lands rests in the general Government, private capital cannot be secured to undertake the work. It is therefore asked that the sum of $500,000 be expended under such rules and regulations as the Secretary of the Interior may adopt in order to inaugurate measures for the development of a system of artesian and subterranean water supplies within the State.

The department recognizes that to no State in the great arid West is the subject of water supply and its conservation of greater import than to Nevada. With the gradual narrowing of the unoccupied lands of the public domain, the reclamation of even a small percentage of the millions of acres of land of inexhaustible fertility located in this State, becomes a question of paramount importance to the nation.

It is further recognized that with a guaranteed and sufficient supply of water no other State, with the exception of California, could equal Nevada in the variety of agricultural products or the certainty of generous harvests.

The water system of a State is an object of interesting study, and it is promised that Nevada will be the field for a very thorough and comprehensive investigation on the part of the experts of the Geological Survey. The

State Legislature, by wise laws, has put itself in close coöperation with the Reclamation Service, thereby assuring the fullest exploitation of its resources by that bureau.

In the matter of an investigation of underground sources of supply, the Director of the Survey will initiate an investigation early this spring which will be continued until complete data on this subject have been obtained. At the present time the department has very little knowledge of any areas in the State where there is sufficient underground water to be pumped to the surface to reclaim public lands. Assurance is given, however, that during the coming season a thorough investigation will be made with a view to ascertaining whether there are such waters, and the conditions under which they can be obtained.

Underground Tests on Los Angeles River.

A paper that will contribute materially to our knowledge of the important subject of underground waters and their use in arid regions has recently been published by the United States Geological Survey. It is a record by Mr. Homer Hamlin of underground tests made in the drainage basin of Los Angeles River and illustrates the conditions under which ground water usually occurs in arid regions and the fluctuations in the water level due to rainfall and other causes. The method used in testing is of special interest. It is a method invented by Prof. Charles S. Slichter, of the Reclamation Service, U. S. Geological Survey, and fully described in an earlier Survey publication entitled "The Motions of Underground Waters." As the method has, up to the present time, been used by few investigators, the details of these tests are particularly important.

It was in September, 1902, that Mr. Hamlin was placed in charge of experiments to determine, if possible, the amount of underflow passing through the narrows of Los Angeles River at Huron street, Los Angeles, California. Velocity measurements were begun under direction of Professor Slichter with the apparatus invented by him. As the work progressed and tests were made at greater depths it was found necessary to modify this apparatus to suit local conditions. The various devices used in the tests, the arrangement of the instruments, the methods of testing found most satisfactory, the results obtained at each of the testing stations, and the amount of underflow supposed to pass the Huron street section are fully described by Mr. Hamlin in his report.

Mr. Hamlin concludes his report with a summary of suggestions based on experience gained during the work at Huron street and in the San Fernando Valley. They are as folows:

(1) The location of the section where it is proposed to test the underflow should be carefully studied. It should be, if possible, in a straight stretch of the valley, and at some distance, either up or down, from large tributary streams.

(2) The form and slope of the water table should be ascertained and the line of test stations should be placed most advantageously.

(3) In order to secure accurate results, the testing stations should be close together along the line of the section.

(4) The well screens should be short, and the ground should be tested at intervals of 2 to 4 feet in depth, down to bed rock when possible.

(5) If possible, the porosity of the pervious beds should be determined.

(6) In making deep tests some form of drive pipe and screen, such as is described in this report, should be used.

(7) Recording ampere meter and switch clocks should be used. The discharge from a given section will undoubtedly be far less than is expected, the popular tendency being to greatly overestimate the amount of underflow. Even if the results obtained by this method of testing are not so accurate as desired, they are,

nevertheless, of great value, as they enable investigators to compute, approximately, what could only be roughly estimated before.

The Underground Waters of Washington.

A brief but very satisfactory account of the water resources of the State of Washington as represented by municipal supplies, deep wells, and springs has been prepared by Mr. Henry Landes, of the United States Geological Survey, under the direction of Mr. N. H. Darton, geologist in charge of the western section of hydrology.

The counties of the State are taken up in alphabetic order and a general statement is made concerning the location, rainfall, and most striking topographic and geologic features of each county. This is followed by data concerning the municipal systems, deep wells, and springs in the county. Information regarding the municipal water supplies is complete to the present time, as blanks were sent to clerks or other officials of cities and towns and practically all were filled out and returned. The blanks for the deep wells were not returned as generally as was desired, but almost every section of the State where such wells occur is represented, and those described may be taken as types of their kind in each county. Springs occur so very generally throughout the State that probably only a small fraction of them is represented in the blanks filled out and returned.

The value of the report is greatly enhanced by a map of Washington, on which is shown the mean total precipitation, and 16 pages of tables of deep wells, municipal water supplies, and representative springs. This paper, which is entitled "Preliminary Report on the Underground Waters of Washington," is listed as Water-Supply and Irrigation Paper No. 111.

To Protect Government Employes.

The registrars and receivers of the U. S. Land Offices in Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Utah, Washington, and Wyoming were recently instructed by the Commissioner of the General Land Office to notify all persons who have heretofore entered, or who may hereafter enter, any of the lands which have been segregated under the provisions of the Reclamation Act of June 17, 1902, that the leasing of such lands or portions thereof to other persons who have been and are conducting the business of selling alcoholic liquors on said lands, principally to the employes engaged on the Government works, that such leasing either by themselves or others will be deemed sufficient cause for the cancellation of the entries embracing the lands so used or occupied.

The officers of the land offices are further directed to give the widest possible publicity to the fact that such use of any lands withdrawn under this act, whether such lands have been entered or are unoccupied, will be prevented by proper actions in ejectment, by injunction, or otherwise.

These instructions have been called forth by the deplorable conditions existing in Nevada, where the Government work employs several thousand man. Homesteaders have leased a portion of their lands to persons engaged in the liquor business, and murder and robbery have been rampant in consequence. The Commissioner's decision is likely to correct these conditions, and will undoubtedly prevent their occurrence in other sections wherein the Government is about to engage upon similar works.

Private Lands Under Government Reclamation Projects.

The Reclamation Act was intended, primarily, to provide for the irrigation of lands belonging to the United States. It was plain, however, to Congress that scarcely any project would be found in which there was not a considerable amount of private land.

The experience of the Reclamation Service has shown that in the most inaccessible localities in the West, more or less private land is encountered in the development of the projects. The majority of the projects which have been under consideration, and among them some which are practically new discoveries, involve in the area to be irrigated a considerable amount of private land.

The proper manner of dealing with these private lands has been a difficult question to solve, having in view the interests of the United States on the one hand and of the private land-owners on the other.

The means adopted for the organization of water users associations involve a specific recognition of prior vested water rights, and those who are in position to claim such rights are left undisturbed as to such claims, the requirements of the Government simply calling for their proper share of the cost of construction of the necessary irrigation works.

In order to protect these projects of the Government from a monopoly of land-owners or water-users, Congress has provided that no right to the use of water shall be sold for more than 160 acres of land in private ownership to any one person, and, further, that the land-owner must be a resident on the land or in the neighborhood, and that no such water right shall permanently attach until all payments therefor have been made.

This involves a limitation upon the use of private lands while the right to the use of water is being paid for. In view, however, of the fact that the water right furnished by the Government enhances the value of the land in a proportion far greater than the actual payments required by the Government, the private land owner cannot properly complain of these restrictions which will be placed upon him during the period of ten years while he is paying for the water right.

When the Government says: "I will charge you $20 an acre in ten annual installments of $2 each, without interest or profit, to furnish water to your land, which is now worth less than $10 an acre, on condition that you will live on it or in the neighborhood during ten years," the land-owner cannot

Ball's Head Reservoir, Colorado River, California and Arizona.

complain if he accepts the offer knowing that, as a result, his land will have a ready sale at $100 per acre or more.

Rapid Work on Minidoka Project.

Work on the Minidoka project, Idaho, is being pushed vigorously and rapid progress is being made. The Secretary of the Interior advertised for bids for the construction of about 21 miles of main canals and 102 miles of branches and laterals on April 12th. This work will involve the excavation of about 3,500,000 cubic yards of earth, 45,000 cubic yards of loose rock, and 170,000 cubic yards of solid rock, and the erection of structures involving 2,000 cubic yards of masonry, 58,000 pounds of steel, 68,000 pounds of cast iron, and 140,000 feet B. M., of lumber.

Specifications, forms of proposal and plans are now on inspection at the office of the Chief Engineer of the Reclamation Service, Washington, D. C., and at the office of District Engineer D. W. Ross, Boise, Idaho.

The Mindoka dam, spillway, and forebay canal now being rapidly pushed to completion, involve the excavation of 205,300 cubic yards of material. The dam is of the rock fill type, and will be 650 feet long on top, 50 feet high, and requires the placing of 110,000 cubic yards of rock, 101,000 cubic yards of earth, 1,200 square yards of rip rap, and 1,000 cubic yards concrete core wall. In the spillways there will be 3,000 cubic yards of concrete, 8,000 cubic yards of rock embankments, 6,500 cubic yards concerte in canal, 3,000 pounds of steel in the same, and 57,500 pounds of steel gates and guides for power and irrigation canals.

Canyon Above Reservoir Site, Salt River, Arizona, Looking Downstream.

At the dam site the river flows through a low ridge of lava rock, the channel being in a solid formation of lava and only 570 feet in width. At low stage the river is from one to two feet in depth over about 400 feet of its bed, most of the water flowing at that time in a channel about 75 feet wide on top and 30 feet deep at the deepest

Garfield Point, Colorado, (Little Book Cliffs) and Orchards in Foreground.

place. The maximum flood discharge is about 50,000 second feet. The construction plant now on the ground consists of an air compressor for driving rock drills, cableways for transporting and placing the material in the dam, a dredge for excavating the gravel and earth to be used for back-filling, a railroad half a mile long for hauling this material to the dam, and a high trestle built across the river from which the major portion of the back-filling will be done. There are two cableways placed parallel to each other and having spans of 1,100 feet. They are suspended from towers, the tops of which are about 1,000 feet above the river. These cables are arranged so that the rock which will be excavated from the upper section of the canal can be transported readily and dumped into the dam. The steel skips or boxes in which the material is loaded when convenient on the cableways, have a capacity each of more than 3 cubic yards, or a weight when loaded with rocks of about 5 tons. These skips are dumped by the tower man, who drops the material into the water from a height of from 40 to 60 feet, thus forming very compact embankments which, when the back filling is added, will be practically water tight.

The construction plant is now in full operation, and the embankments constituting the first section of the coffer-dam will soon be ready for the construction of the core walls. The contract provides for the completion of the dam and spillways by November 17, 1905, and the construction of the dam will provide splendid facilities for the development of power. The minimum discharge of the river at this point which will be available for this purpose, is 2,100 second feet. This can easily be increased to 3,000 second feet by storage on the headwaters of the stream. This water can be passed through walls under a head of about 50 feet, which will provide for the development of more than 17,000 horse power. It is proposed to use the major portion of this power for pumping water to lands situated above the gravity system of canals which will be constructed during the coming season. From 50,000 to 75,000 acres can be reclaimed at a reasonable cost by pumping.

Bids are also asked for the construction and completion of a pole line and telephone system about 18 miles in length in connection with this project.

RECENT PUBLICATIONS

The Prickly Pear and Other Cacti as Food For Stock. Bulletin No. 74, Bureau of Plant Industry, U. S. Department of Agriculture. By DAVID GRIFFITHS. Pp. 46, with five half-tone plates and several line drawings. Washington, Government Printing Office, 1905.

An investigation of the forage value of different species of cactus was undertaken by the Bureau of Animal Industry, in response to numerous letters requesting such information. The investigation revealed the fact that certain cacti have long been in use as forage, and the Bulletin noted here contains descriptions of the varieties most suited, and methods of preparing the same. A large part of the investigation is still under way in regard to the chemical composition of the most useful forms, methods of planting, yield, varieties, methods of preparation, and feeding, etc., but this preliminary Bulletin contains some very valuable information for the stockman. In view of the recent "spineless cactus" achieved by Luther Burbank, it is interesting to note that the Agrostologist says that "if it were not for the spines on this class of plants they would probably have been exterminated long ago, and there is some doubt whether there would be any use for spineless forms."

The Luquillo Forest Reserve, Porto Rico. Buletin No. 54, Bureau of Forestry, U. S. Department of Agriculture. By DR. JOHN GIFFORD. Pp. 52, illustrated. Washington, Government Printing Office, 1905.

The Bulletin noted here embodies the investigations made by Dr. Gifford recently on a special trip undertaken for the purpose of determining the general conditions, forest wealth, accessibility, and industrial conditions of the Luquillo Forest Reserve, which was set aside by proclamation of President Roosevelt on January 17, 1903.

THE

National Irrigation Association

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The objects of the Association, as set forth in its Constitution, are as follows:

1. The adoption by the Federal Government of a permanent policy for the reclamation and settlement of the public domain, under which all the remaining public lands shall be held and administered as a trust for the benefit of the whole people of the United States, and no grants of the title to any of the public lands shall ever hereafter be made to any but actual settlers and homebuilders on the land.

2. The preservation and development of our national resources by the construction of storage reservoirs by the Federal Government for flood protection, and to save for use in aid of navigation and irrigation the flood waters which now run to waste and cause overflow and destruction.

3. The construction by the Federal Government of storage reservoirs and irrigation works wherever necessary to furnish water for the reclamation and settlement of the arid public lands.

4. The preservation of the forests and reforestation of denuded forest areas as sources of water supply, the conservation of existing supplies by approved methods of irrigation and distribution, and the increase of the water resources of the arid region by the investigation and development of underground supplies.

5. The adoption of a harmonious system of irrigation laws in all the arid and semi-arid states and territories under which the right to the use of water for irrigation shall vest in the user and become appurtenant to the land irrigated, and beneficial use be the basis and the measure and limit of the right.

6. The holding of an annual Irrigation Congress, and the dissemination by public meetings and through the press of information regarding irrigation, and the reclamation and settlement of the arid public domain, and the possibilities of better agriculture through irrigation and intensive farming, and the need for agricultural education and training, and the creation of rural homes as national safeguards, and the encouragement of rural settlement as a remedy for the social and political evils threatened by the congestion of population in large cities.

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